Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

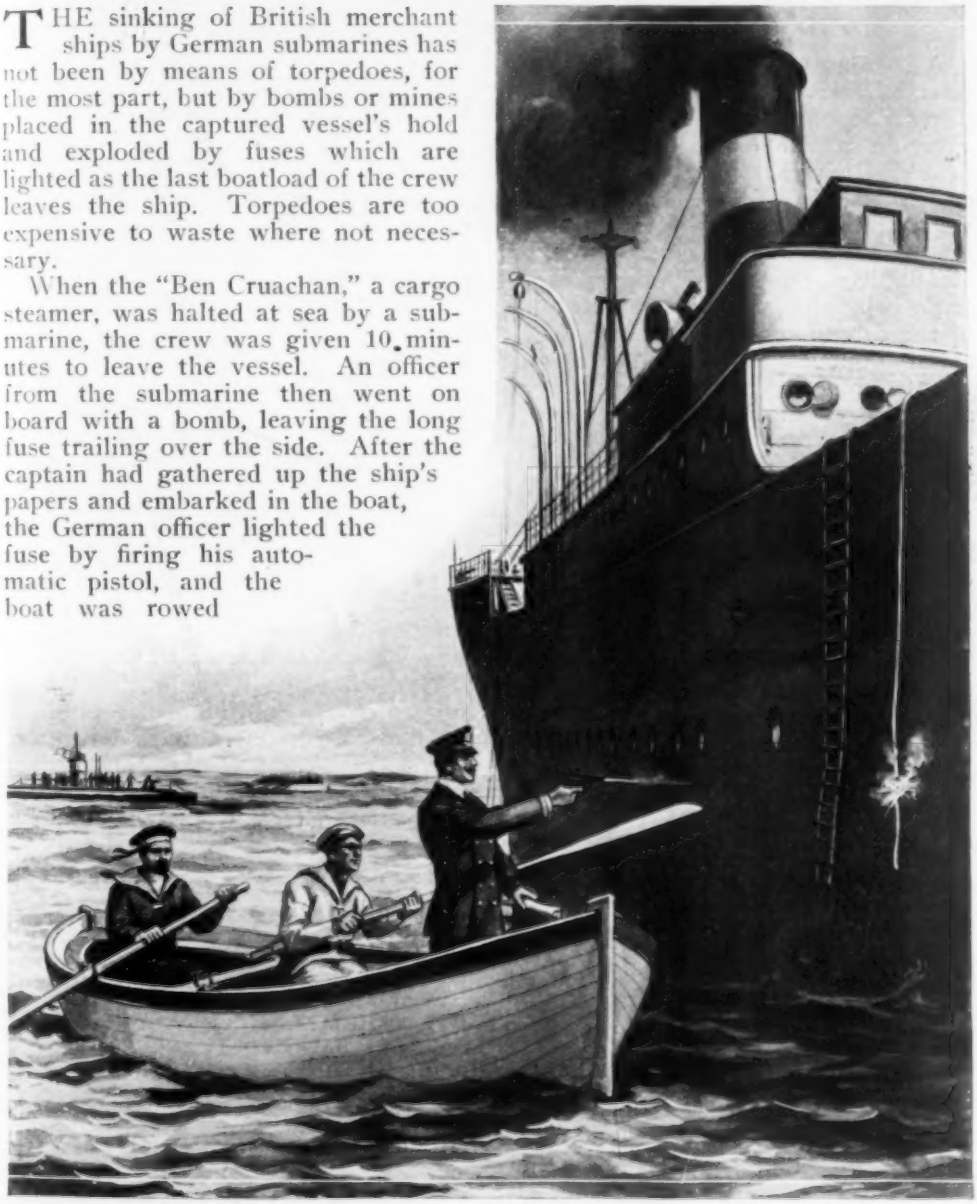
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 23 MAY, 1915 No. 5

Firing the Fuse to Blow Up a Steamer

THE sinking of British merchant ships by German submarines has not been by means of torpedoes, for the most part, but by bombs or mines placed in the captured vessel's hold and exploded by fuses which are lighted as the last boatload of the crew leaves the ship. Torpedoes are too expensive to waste where not necessary.

When the "Ben Cruachan," a cargo steamer, was halted at sea by a submarine, the crew was given 10 minutes to leave the vessel. An officer from the submarine then went on board with a bomb, leaving the long fuse trailing over the side. After the captain had gathered up the ship's papers and embarked in the boat, the German officer lighted the fuse by firing his automatic pistol, and the boat was rowed



How Merchant Ships are Destroyed in War: Firing the Fuse of a Bomb by the Flash of an Automatic Pistol

quickly away. The officer returned on board the submarine, which disappeared, while the crew of the "Ben Cruachan" rowed toward some fishing craft a few miles distant. The doomed ship blew up and sank in a few minutes.

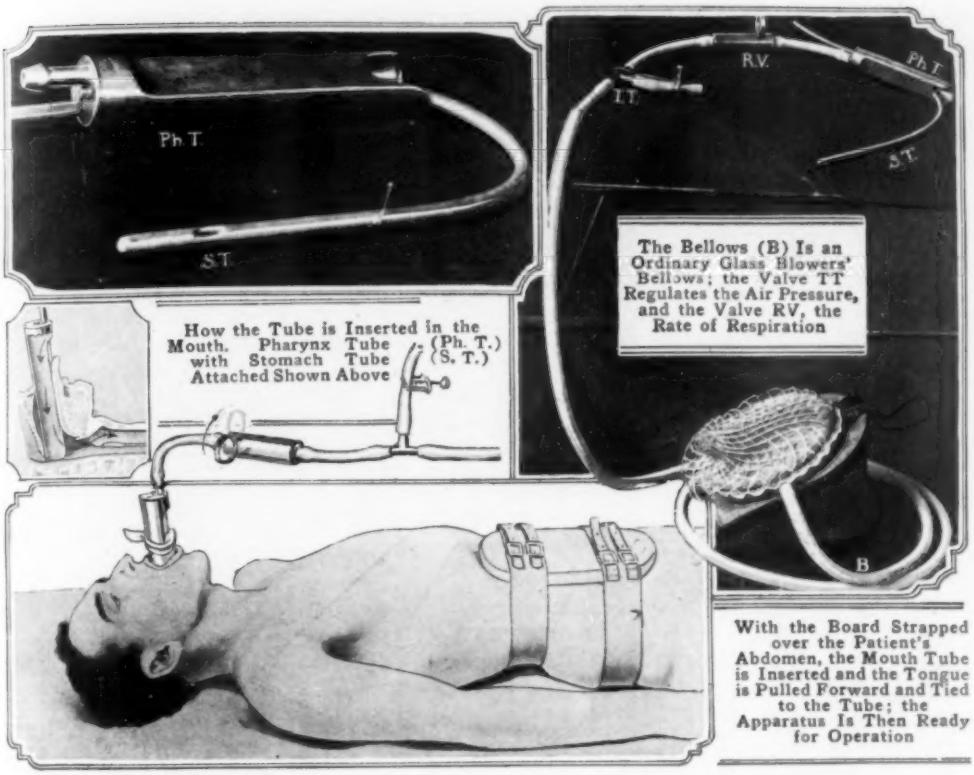
AUTOMOBILE TRAVELS ON LAND AND WATER

A curious vehicle that travels both on land and water has been brought into service on the coast of Oregon, for carrying passengers between Marshfield and a railway terminal 65 miles distant. This vehicle, which the inventor calls the "Amphibion," consists of an automobile body mounted on standard wheels and equipped with large pontoons, one fixed to each side of the car. The craft is driven by an aerial propeller, having a diameter of 7½ ft., and operated by an 80-hp. aeroplane engine. Along the smooth beach sands the "Amphibion" has attained a speed of 75 miles an hour. When the driver comes to a bay or inlet he drives boldly into it. The pontoons float the vehicle, while the aerial propeller drives it across the water at a speed of 15 miles an hour. It is built to carry five passengers besides the driver, and the 65-mile trip is made with ease in 2½ hours.

This Vehicle, Equipped with Pontoons and Driven by an Aerial Propeller, is Used for Transporting Passengers along the Oregon Coast

RESPIRATION DEVICE FOR TETANUS TREATMENT

In connection with the treatment of tetanus or lockjaw, a disease that has proved to be the greatest menace of all to soldiers wounded in the European war, an apparatus has been developed which is apparently certain to come into general use in cases where it is necessary to resort to artificial respiration. This apparatus is not used in the treatment of tetanus, but in preventing one of the medicines used in the treatment from proving fatal. Tetanus can only be treated successfully by means of antitetanus serum. It takes this serum several hours to act and in the meantime the victim is in danger of dying from the violent convulsions that accompany the disease. To provide relief from the convulsions and thus keep the victim alive until the serum has time to act, a solution of epsom salts injected under the skin, into a vein, or into the mucous membrane of the spinal column, is used, the latter method being imperative if the disease has reached a violent stage. This simple remedy stops the convulsions, but it also causes so complete a relaxation of the muscles that there is danger that the lung muscles will cease to act and the victim will die of suffocation. The new apparatus is designed to produce and maintain artificial respiration until the muscles begin to act normally, and thus make it possible to give as much of the epsom salts as may be necessary.


Ph T
S T
How the Tube is Inserted in the Mouth. Pharynx Tube (Ph. T.) with Stomach Tube (S. T.) Attached Shown Above
R.V.
Ph T
T T
S T
The Bellows (B) Is an Ordinary Glass Blowers' Bellows; the Valve TT Regulates the Air Pressure, and the Valve RV, the Rate of Respiration
B
With the Board Strapped over the Patient's Abdomen, the Mouth Tube is Inserted and the Tongue is Pulled Forward and Tied to the Tube; the Apparatus Is Then Ready for Operation

This apparatus works on the principle of insufflation, a process that consists in expanding the lungs with air at regular intervals of about 12 to the minute and depending on the elasticity of the chest walls to expel a portion of the air during each intervening period. In using the apparatus, a board is first strapped tightly over the abdomen to prevent the stomach instead of the lungs from being expanded with the air. The mouth tube attached to the apparatus is then placed in the mouth and pushed as far back as it will go, and the tongue is pulled forward and tied to the tube. The tube pushes the soft palate upward and effectually closes the passageway through the nose so that no air can escape through the nostrils, while an opening in the bottom of the tube permits the air to pass freely down the throat.

For supplying the air, an ordinary glass blowers' bellows is used. As the air goes up the tube it passes a valve which regulates the inspiration and expiration. With watch in hand, the attendant turns the ring that governs this valve alternately to the right and left at regular intervals. When the ring is turned to the right the air is forced into the lungs, and when the ring is turned to the left the pressure is shut off, a small vent is opened and the air escapes from the lungs. Just below this valve is one for regulating the pressure of the air given the patient. At the start the pressure used is very low, but is increased by a gradual closing of the valve. At the end of a minute the patient's breast is usually heaving regularly and the full pressure is applied.

In case the apparatus is hurriedly called into use during an abdominal operation, in which case the abdominal board cannot be strapped on, a small tube is passed through the mouth tube and inserted into the

stomach and the air escapes through this as fast as it is forced into the stomach. An important feature of the apparatus is that it can be operated by one man, who need not be an expert. The bellows is worked by the feet and the respiratory valve is operated by the right hand, leaving the left hand free for making any adjustments that may be necessary.

FIRELESS COOKER USED FOR DELIVERING HOT FOODS

Fireless cookers used in connection with a coöperative kitchen in a city in New Jersey are said to contribute more than does any other one feature to the success of the enterprise, since with these it is possible to deliver the food steaming hot to the users of the service. Each of these cookers is equipped with a number of compartments nested together. Each is provided with a bail, and with this the cooker is carried direct to the dining room of the customer without removing the foods from the compartments in which they have been cooked.

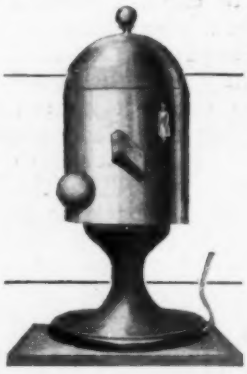
COPYRIGHT, INTERNATIONAL NEWS SERVICE

WINDSTORM LEAVES RECORD IN GROWING TREES

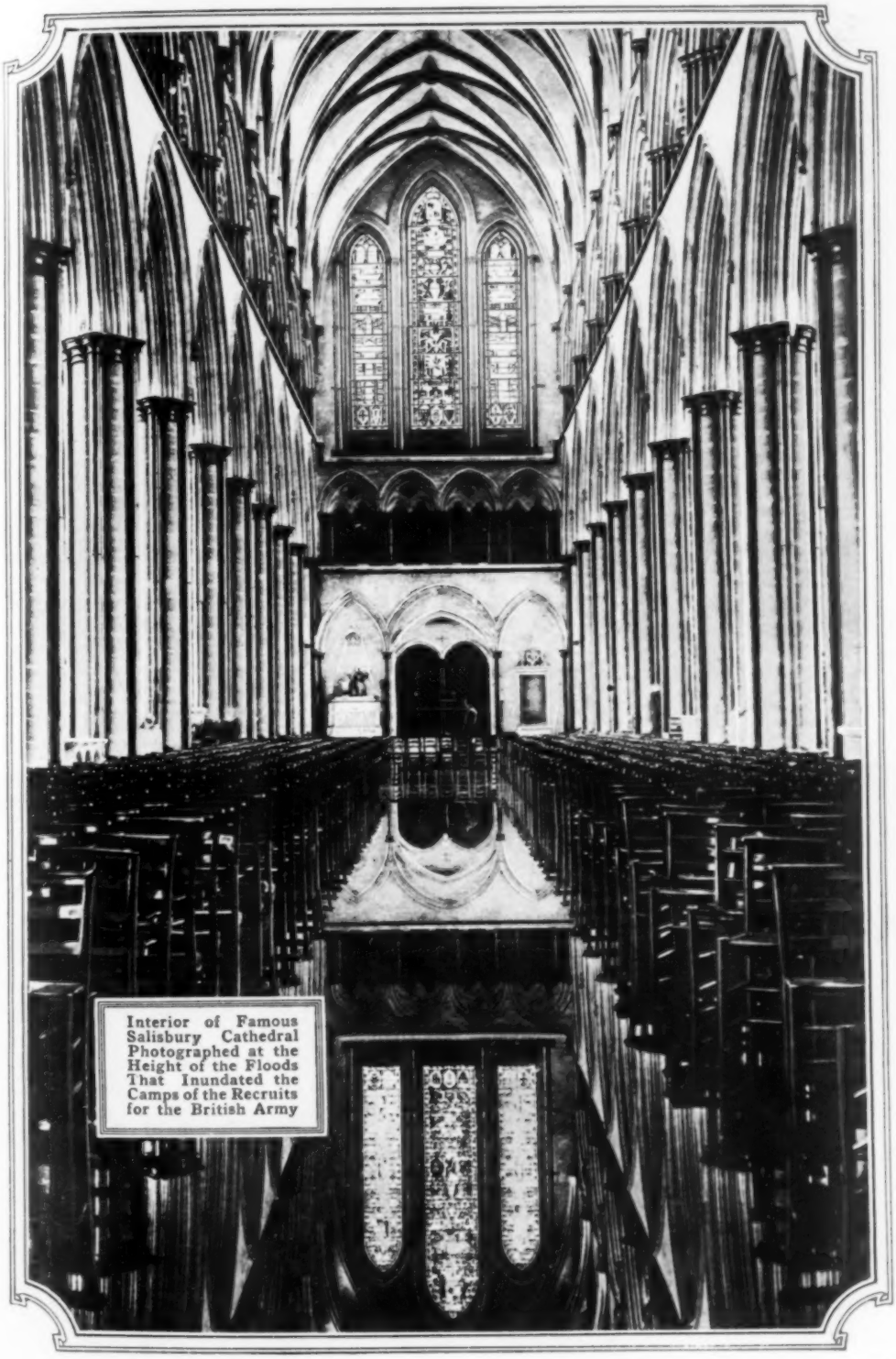
The little diagonal streaks or wrinkles across the grain that indicate weakness in timber are not only caused by rough handling but by wind stresses during the growing period and can sometimes be used to check official records of windstorms, according to a report issued by the United States Department of Agriculture. The marks are caused by "compression failures," which occur when the fibers bend or buckle under a too heavy strain. In cutting up logs at the laboratory it was found that such wrinkles appeared on the north side of a number of trees coming from the same locality in Florida. By counting the annual rings of the wood it was decided that the wrinkles must have been caused by a severe windstorm from the south about the year 1898. Inquiries made in Florida revealed the fact that a hurricane had swept over the region at the time indicated.

CLEVER NOVELTY DESIGNED FOR ADVERTISING USE

An ingenious advertising novelty intended for window-display purposes has been invented in France, which, because of the seemingly mysterious manner in which the law of gravity and other physical rules are apparently violated, easily attracts and holds the attention of passers-by. It consists of a hollow metallic cylinder supported on a pedestal and connected by electric wires which are easily hidden from view. Inside the cylinder is a revolving electromagnet. When the device is in operation, such articles as a doll, a cigarette box, and a ball move slowly about its circumference, to all appearances suspended in air without any means of connection. On the interior of each, however, is a soft-iron core which is attracted to the circular wall by the drawing power of the magnet. Since the latter member constantly rotates, the objects clinging to the outside move with it.



WHEN THE WATERS ROSE ON SALISBURY PLAIN



Interior of Famous Salisbury Cathedral Photographed at the Height of the Floods That Inundated the Camps of the Recruits for the British Army

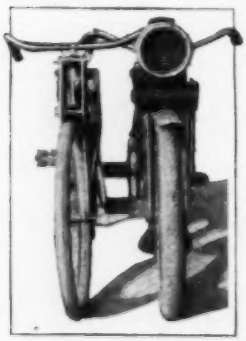
COPYRIGHT, UNDERWOOD & UNDERWOOD

DANISH MOTOR SHIP BROKEN IN TWO ON ROCKS

WHILE en route from the Pacific coast to Copenhagen, the Danish motor ship "Malakka" was driven during a severe gale onto Red Rock at Cedros Island, off Sebastian Vizcaino Bay, on the coast of Lower California. The breakers pounded the vessel with such force that it broke completely in two amidships, separating far enough for a small-sized boat to pass through the gap and exposing the cargo, consisting of wines, flour, and general freight, to the sea. The vessel was 410 feet in length and had a 52-foot beam and a gross register of 5,150 tons. It was making its maiden voyage in the service of new owners when the wreck occurred.

LIGHT-WEIGHT MOTORCYCLE OPERATES INEXPENSIVELY

To bridge the gap between the ordinary bicycle and the modern, high power motorcycle, a light-weight medium-power machine has been developed. It is built with a sturdy frame of the loop type, much lighter than that of the average motorcycle. With its tanks filled the machine weighs only 110 lb. as compared with the approximate average weight of 260 lb., or more, of the larger cycle. In its design and means of control, there is little difference between it and its predecessor. Because of its lightness, it uses smaller and less expensive tires and may be operated very cheaply.



CEMENT COATING FOR STEEL IMMERSED IN SEA WATER

From tests made to determine the degree of protection against the action of sea water given to steel by coating it with cement, it has been found that the life of steel structures immersed in sea water can be considerably prolonged by such coatings from ½ in. to 1½ in. thick, but that the protection is not great enough to dispel all apprehensions as to their permanency under such conditions.

DIRECTING THE WAR BY WIRELESS

By GEO. F. WORTS

U. S. Licensed Wireless Operator, First Class

THE European war cloud burst at the psychological moment in the career of wireless telegraphy, for only very recently has the art based on the science of ether waves been reduced to the reliable basis of a sound industry. Five years ago, or even less, wireless could not have responded to the exacting demands which this war is putting upon it.

At the beginning of hostilities cables and telegraph lines were ruthlessly cut. Germany, more than any other belligerent, has been in an exceedingly trying position as regards external telegraphic communication, surrounded as she is by enemies on all sides. Her main cables have been cut or disconnected, so that now her only electrical communication with the outer world is by wireless. At the outbreak of the European war, Germany had 17 government wireless stations, Austria-Hungary, 4; France, 18; Russia, 28; and England, 47.

One of the first tasks of the wireless of the various warring countries was to fill in the gaps caused by severed cables. As later incidents have proved, however, that was only an insignificant portion of the work. Hundreds of miles of roaring battle line, hostile warships roving the remotest wastes of the sea, aeroplanes and Zeppelins soaring high above the earth, even the stealthy submarines, lurking in the depths for victims, are subservient to the invisible hand of the wireless.

The wireless equipment with which General Joffré keeps in touch with the fighting line of the allies has a range of 200 miles, and is portable. Within 15 minutes after the command is given, the station can be erected and put in operation. At the front, smaller and lighter equipments, known as "knapsack" stations, are employed. These are so constructed that one complete set can be divided up and carried by four men, with an average weight to each man of 20 lb. Five minutes after the command for erection is given, these sets are in operation.

Besides the knapsack stations, a new and ingenious auxiliary equipment has been devised for cavalry scouting duty, called "whisker wireless." This odd name arises from the bristling appearance of the antennae which project like the quills of a porcupine from the horses' flanks.

"Landing stations," having a range of 50 miles and designed for impromptu service, are used by the marines. For example, when a cruiser anchors off shore and sends a detachment of men for scouting duty, they carry with them this very compact equipment which can be set up hurriedly.

Probably the most novel use to which wireless has been put in this war is in aeroplane service. The equipment installed on the French and Belgian fliers weighs about 100 lb., and is exceedingly compact and simple. The metal frame of the aeroplane forms the antennae, while a long trailing wire is used for "ground." This wire is attached so that should it become entangled in a tree or other obstruction, it automatically pulls loose, and another one is substituted.

Wireless communication over a distance of 54 miles has been carried on from an aeroplane to a land station in the U. S. Army, but greater ranges than five to ten miles are not practical or necessary. In service, the wireless-equipped aeroplane is sent on scouting duty over the enemy's lines from a base at which a knapsack station is located. It is rarely necessary for the aeroplane to fly to a greater distance than two or three miles from this base. As he flies over the enemy, the operator telegraphs the condition or maneuvers of the enemy to the knapsack station. Surprises on both sides are constantly being frustrated in this manner. As a matter of incidental interest, it is due principally to this fact that there have been no recorded surprise attacks made by

either side on the Franco-German frontier and that a deadlock exists now.

The wireless telegraph comprises an important part of the equipment of Zeppelins. Much greater transmitting power, due to a larger space allotment; is made possible on the Zeppelins and French dirigibles. A greater range also results from the use of a larger antennae system.

A wireless direction finder, to supplement the aeroplane spying service, has recently been adopted by the British for the purpose of locating wireless stations at German artillery bases. When the approximate location of a battery is thus found, the British and French guns are trained upon it. An English radio engineer, who recently visited this country, made the statement that by means of one of the field direction finders the exact location of the admiral's ship of the "hidden" German fleet had been discovered by an officer.

The secrecy of the interior of submarines is proverbial, but it has been stated on authority that a wireless equipment of short range is in use on the majority of underwater craft. When a submarine is cruising on the surface, a short mast, or the periscope tube, is used for suspending a small antennae system. The equipment closely resembles the aeroplane installations. For an aerial conductor, when the craft is traveling submerged, an insulated jet of water is substituted for the regular antennae.

Practically every move that the British, French, or German fleets make is the result of a radio order from the respective war office. The impotence of Germany's bottled fleet at present rather limits this use of her wireless service, although the British fleet relies upon orders via radio exclusively. England directs the maneuvers of her fleets from the Marconi station at Carnarvon, Wales; Germany, from Nauen, and France, from Paris. Except for one hour each day, Carnarvon transmits the orders of the British Admiralty to the various ships in a very complex secret code, which is changed daily. To further insure secrecy, the wave length is frequently and suddenly changed. The principal advantage gained in directing fleets wirelessly is that fewer ships can now do the work of the many which were formerly required. Before the days of radiotelegraphy, ships of a fleet clung together, and orders were either semaphored or carried from ship to ship by fast cruisers. A naval battle line, 200 or 300 miles long, is now quite feasible, while in the days before wireless telegraphy one only a fraction of that length was possible.

Except when a warship is actually under fire the wireless room is perhaps the liveliest place on board. Every message caught on the instrument, whether intended for that particular ship or not, is delivered to the captain. Whenever anything suspicious is sighted—smoke on the horizon or a speck in the sky that might be a Zeppelin—it is immediately reported to the rest of the fleet. Aside from messages of a general character, such as this, the operator must be constantly on the alert for battle orders from the admiral. The rôle played by the wireless operator in war time is certainly not a desirable one, at least from the standpoint of personal safety. He is always shut up tightly in his room, fully aware of the dangers of attack by air, sea, and submarine.

The Eiffel Tower station at Paris has a most systematized method of collecting information from all parts of the war zone. By the use of an ingenious recording apparatus, any number of messages, up to ten, can be received simultaneously. An incidental purpose of the Eiffel Tower plant is to transmit news to the soldiers in the trenches. The tremendously high-powered transmitting apparatus, combined with the 900-ft. high tower, makes a 3,000-mile range possible, so that France is kept in constant touch with her fleet.

Perhaps the most romantic use to which wireless has been put in the war was in the case of the "Emden," the German cruiser which, early in the

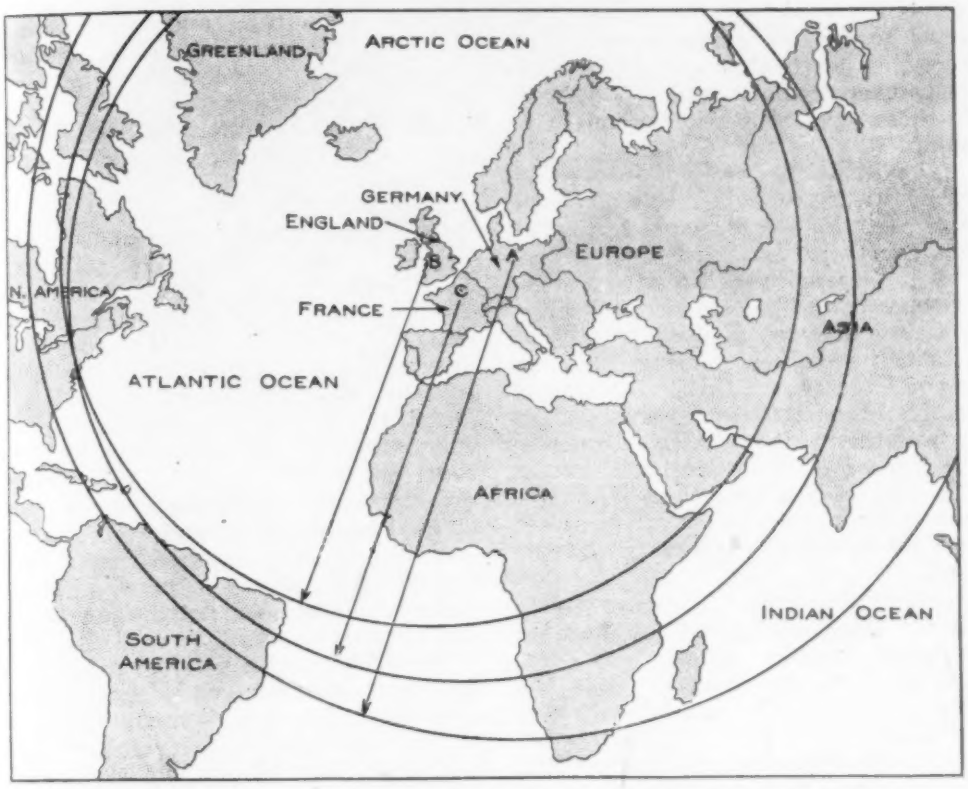


Diagram Showing Range of Wireless from Nauen (A), Carnarvon (B), and Paris (C)

war, sank many British merchant ships in the Indian Ocean. It is stated by those who claim to know that the "Emden" received all its instructions direct from the enormously high-powered station of Nauen, Germany. The signals sent out from Nauen are so powerful that they can very often be heard on amateurs' instruments in the United States—a distance of nearly 4,000 miles. With this exceptional working range, the "Emden," or any other ship for that matter, might receive orders if she were cruising near Greenland, Rio Janeiro, Cape Town, or Singapore. It is quite probable, therefore, that the "Emden" accomplished her work from orders or information she received from Nauen while she was cruising in the Indian Ocean. Strangely, wireless also proved the "Emden's" undoing. Just before she attacked Direction Island and demolished the wireless and cable stations there, one of the Direction Island wireless operators flashed out an S O S call. This was picked up by the "Sidney," and the engagement shortly followed in which the "Emden" was sunk.

The "Karlsruhe," another German ship, acting with her convoys, adopted an ingenious dragnet method of capturing British vessels. The German cruisers reduced the sending radius of their apparatus to 30 miles, and traveled forward in a circular formation no more than 30 miles in diameter. When an enemy was sighted by one of the circle, the others were notified and the ring closed in on the helpless victim. By thus reducing the transmitting range the possibility of attack by British warships was very slight.

The inevitable command of the Germans upon capturing a ship is "Don't use your wireless!" Usually that or-

der is followed by imperative instructions to cut down the antennae and throw it overboard together with the instruments. For what is so helpless in these days as a ship without wireless?

The British war code is so complicated that it should be insoluble. Once, however, the Germans used it to advantage in a "fake" message. When the war started, the "Breslau" and the "Goeben" were bottled in the Strait of Messina, between Sicily and Italy, by a British squadron. During the morning of August 6, the British commander received a wireless message, apparently from the British Admiralty, ordering the release of the "Breslau" and the "Goeben." Not until long after the two German ships were safely at sea was the falsity of the message discovered.

One of the most interesting phases of the wireless-in-war-time question concerns secretly operated stations. The press, on numerous occasions, has appeared with the announcement of the existence of a hidden wireless station in this country operated by one of the belligerents. This possibility is so remote as to be ridiculous. An amusing example of this occurred recently when various newspapers announced that the "Germans and Japanese were suspected of operating hidden plants in Lower California and the Maine woods." Whoever was the well-meaning source of this information, the fact remains that the supposed "German station in Lower California" was none other than the new Marconi transpacific station at Bolinas, Cal., while the "hidden radio plant" in the Maine woods turned out to be a perfectly harmless commercial station at Wellfleet, Mass. The U. S. Government would have a tremendous task on its hands if an attempt should be made to dismantle all privately owned stations, as more than 100,000 of them exist. Germany, France, and England, however, whose wireless laws have always been much stricter than ours, have ordered every private aerial down and all instruments disconnected.

Numerous "wireless spies" have been discovered in all of the warring countries, and when convicted they have met the customary fate.

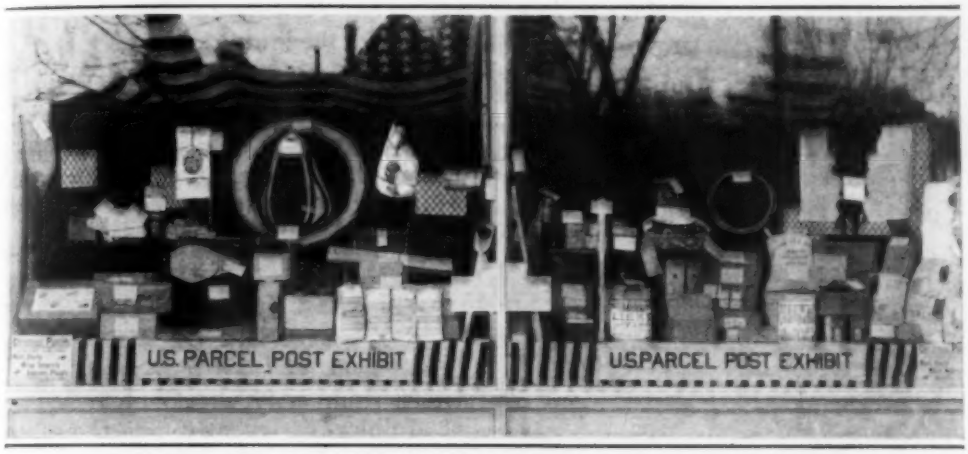
Interference with wireless messages as they are now handled by the perfected army and navy equipments is practically impossible. Telegraph wires and cables may be cut, but a wireless wave cannot be stopped. "Jamming," or sending out waves of the same length as a transmitting station to confuse the receiving operator, is averted by making frequent changes of wave length at known intervals.

ARCH SUPPORT IS ATTACHED TO OUTSIDE OF SHOE

Made of rubber so as to be flexible and yielding, an arch supporter has been introduced which is intended to be attached on the outside to the shank of a shoe, instead of being worn on the inside next the foot, as has heretofore always been done. A means of fastening the supporter in place has been devised so that while it is held securely it may also be detached and applied to another shoe in a moment's time. A pair of clips are tacked to the shoe under the arch of the foot, while two flanges extend from metal pieces anchored in the rubber block. By means of these connecting members the device may be applied quickly.

ADVERTISING PARCEL POST BY WINDOW DISPLAY

A novel and effective method of advertising the U. S. Parcel Post was devised by the postmaster of Cañon City, Colo. The post office has a large show window, and in this were placed a great variety of articles that could



How a Colorado Postmaster Advertised the Advantages of Parcel Post

be or had been shipped by parcel post. The list included boxes of apples, sacks of flour, hams, rocking chairs, shovels, and many other commodities the sending of which by parcel post would not ordinarily occur to most people. Each was properly wrapped, tagged, and addressed, and placards showed the weight and the cost of postage to different points. One result has been a large increase in the parcel-post business at Cañon City.

WAR CAUSES EXTENSION OF ELECTRIC LIGHTING

Since both petroleum and copper are essential military supplies, the German people have had to face the problem of finding a substitute for kerosene for lighting purposes that would not involve the construction of additional copper electric-light circuits. The answer was found in a soft-iron wire, insulated with impregnated paper and inclosed in a water-tight metal covering. With this wire, electric lighting is being installed in thousands of houses that had formerly been lighted by oil. Many new gas installations are also being made since the government took over all supplies of copper and petroleum, while alcohol and acetylene lights are being adopted in the country districts.

SPEAKING TUBES ARE USED BY MOTOR-CAR RACERS

At a motor race run at Los Angeles recently, the driver of one car and his mechanician wore helmets and masks which were linked with speaking tubes that enabled them to talk freely to each other. When a machine is tearing along a track at high speed, the reports of the explosions in its engine cylinders also producing a loud roar, it is next to impossible for either occupant to make himself heard if he wishes to communicate with the other. In this instance speaking tubes, extending from the mouth of each person to the ears of the other, were used.

Speaking Tubes Joined the Helmets of These Auto Racers, at a Recent Speed Contest, Enabling Them to Talk Freely to Each Other While Driving

EMERGENCY MOTOR-CAR TIRE MADE OF WOOD

Intended only for emergency use on the road, a wooden motor-car tire has been invented to do away with the necessity of carrying extra casings which are expensive and in danger of being stolen when a machine is left unattended. The tire is made in three sections and so designed that it is held fast to the rim by a single bolt, while the operation of fitting it in place is one which requires only a very few minutes. On the inner side of each section are rubber pads which are intended to absorb the shocks. Except for a thin steel band, encircling the circumference of the tire to lessen the wear on it, no metal is visible. It may be carried set up in a holder, or may be unjointed and placed beneath a seat.

Made of Wood and Divided into Three Sections, This Motor-Car Tire is Held to the Rim by a Single Bolt

GAS EXPLOSION IS CAUSED BY ROBBERY OF METER

An explosion of illuminating gas which completely wrecked a residence at Moline, Ill., recently, was the aftermath of a burglar's breaking into the house and robbing a gas meter of the "quarter-first" type. In order to get the money out of the meter the thief tore it loose from its connections and then broke into it. Later, when the occupants of the house returned after an absence of a few hours, a match was ignited. Instantly there was an explosion which blew out the ceiling of one of the rooms, lifted the roof off one side of the house and broke all the windows. Although half of the house was nearly demolished, the person who ignited the match was uninjured.

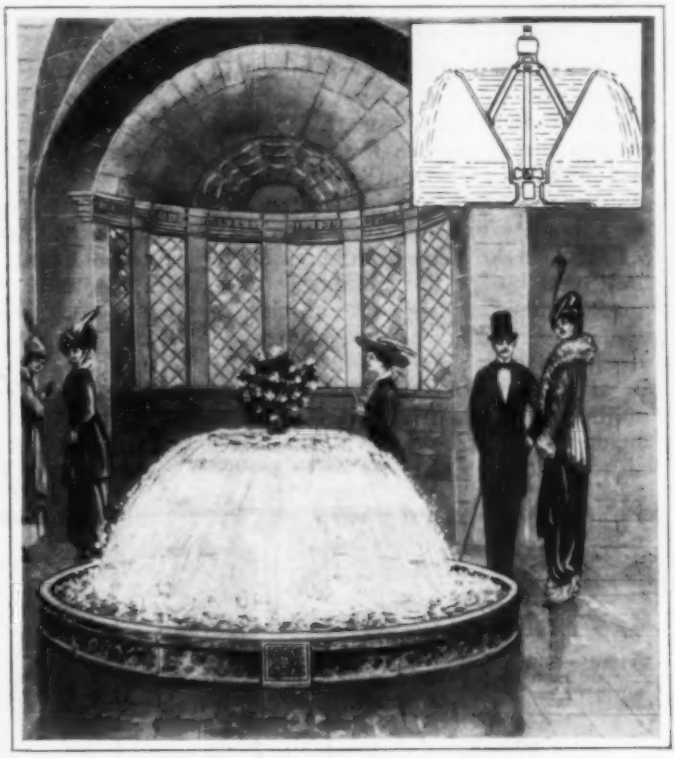
The Roof of This House was Blown Off by an Explosion of Illuminating Gas Which did Not Injure Those in the Room in Which It Occurred

FOUNTAIN USES SAME WATER OVER AND OVER

The use of fountains in landscape gardening and architectural ornamentation is much less common than formerly, owing to the expense of keeping up a steady flow of water which runs to waste without serving any useful purpose save the decorative one. In some municipalities where the public water supply is pumped at great expense, the use of fountains on private grounds is forbidden by ordinance. Other cities forbid their operation except within stated hours, while in almost every city where fountains are permitted to operate freely the cost of the necessary amount of water to produce the volume of flow requisite for the most attractive effects is almost prohibitive.

An entirely new kind of fountain recently patented by Dr. Nikola Tesla, the famous electrical inventor, is designed to do away with the existing drawbacks to the use of water fountains for ornamental purposes. The device consists of a basin large enough to hold the entire volume of water required; a central pipe rising to any desired height from a point well below the water level, and flaring, or lipped, at the upper end to shape the flow of the falling water; a screw propeller, or turbine, so placed inside the pipe and below the level of the water in the basin as to propel the water up the pipe when rotated, and an electric motor mounted at the upper end of the vertical shaft of the turbine. The wires supplying current for the motor may be brought down from above or, if it is desired to conceal them, they can be easily led through water-tight tubes along the central pipe.

With a properly designed propeller a very large volume of water can be passed through this fountain in a continuous stream, producing beautiful effects as well as serving to humidify and cool the air when used indoors. Experiments on a large scale have shown that it is not necessary to replenish the water for weeks, when the fountain is operated continuously, for the entire volume is passed through the fountain several times a minute and becomes aerated and purified in the process.



A New Kind of Fountain That Uses the Same Water Over and Over Again. A Diagram of Its Construction is Shown Above

A fountain of this type, requiring no external water connection, may be moved from one place to another easily, and when constructed of small size, serve as a banquet-table decoration.

Overflow basins may be arranged in tiers so as to provide for a series of falls by extending the central pipe upward and providing outlets for the water at different levels. Colored electric lights can be placed behind the falling water to produce gorgeous effects. The cost of electric current to operate this fountain is said to be very small indeed.

ADJUSTABLE POLE HOLDER FOR FISHERMAN

Designed so that it may be used in a number of different ways, a fishing-rod holder has been invented which performs a real service for the fisherman who is using several poles simultaneously, especially if he be trolling from a boat. The device is made of sheet steel in the form of an adjustable socket, which, by the changing of a pin, regulates the angle at which the pole may be held. It is possible to use it in almost any place, from the gunwale of a boat to one's trouser belt. A small bell is also provided which fits to the device and sounds an alarm when a fish takes the bait.

HOW MUCH IT COSTS TO BUILD WIRE FENCE

An idea of the cost of building barbed-wire fence is given in a circular relating to fence building in North Dakota, recently issued by the United States Department of Agriculture. The costs in North Dakota are high owing to the fact that all material, including posts, must be shipped in, and for this reason the figures are thought to represent practically a maximum for this country. The maximum cost per rod is 36.9 cents, for a three-wire fence with posts spaced one rod apart. A two-wire fence with posts spaced one rod apart costs 32.2 cents per rod; a four-wire fence with posts spaced two rods apart costs 29.7 cents, and a five-wire fence with posts spaced three rods apart, 30 cents. The figures also show the low cost of wire as compared with posts both in construction and in upkeep.

¶One hundred and thirty-three foreign-built ships with aggregate tonnage of 475,524 had changed to American registry up to March 1, 1915.

A Convenient Holder for a Fishing Pole Which Is Especially Serviceable When Several Lines are Trolled from a Boat

RAISING THE STANDARD OF CANNED GOODS

How the Pure-Food Laws and the Cooperative Efforts of the Canners have Revolutionized the Industry

WITH a can opener and a corkscrew as her only kitchen implements, the housewife of the future—or even of today—can feed her family better food and in wider variety than her mother, with a whole armory of pots and pans, could ever dream of doing. The day when wholesome, nourishing, palatable food could be prepared only at home has passed, never to return. Canned goods are no longer regarded in the light of "emergency rations," but have become firmly established as an important part of the domestic economy of almost every American household. Nor is it difficult to understand the reasons for the enormous increase in the consumption of cannery products in the past two or three years.

A universally higher standard of quality, due to the greatly improved methods of canning stimulated by national and state pure-food laws; the extension of this method of preparation to a long list of foodstuffs that a few years ago had to be cooked at home, if at all; and economy, if not actually in dollars and cents, at least of the housewife's time, labor, and nerves—these are the underlying causes of the change.

Foodstuffs can now be obtained in cans, or other containers, in such wide variety that not only a complete dinner, but dozens of kinds of dinners can be served with no labor other than that of opening the containers and heating such foods as are to be served hot. A recent list of canned foods, which had received the approval of one of the pure-food laboratories, named 132 different kinds of edibles. It would be hard to mention any sort of food outside of fresh meats that cannot be obtained in cans or packages of some kind.

The steady improvement in the quality of commercial canned goods, which has almost entirely removed the prejudice that formerly existed, is due in large part to the action of the canners themselves, who, through their national organization, are attempting to see to it that all canned foodstuffs placed on the market shall be canned under sanitary conditions, free from impurities, and honestly labeled. This National Canners' Association is an organization working in close touch with the Department of Agriculture and is made up of the manufacturers of about 75 per cent of all the canned goods produced in the United States. While this organization is neither altruistic nor charitable, it is not commercial, since it has no part in the profits arising from the trade and will not permit its name to be used in connection with the advertising of any canner. In its laboratory, at Washington, D. C., is complete apparatus for testing canned goods of every kind; for experimenting with raw foods to determine the best methods of canning; for making tests to solve the problems of individual members of the association who are having trouble with their processes, and for testing materials for determining the best kinds of containers for different foods. Installed in the basement of the laboratory is a small but complete canning plant for experimental purposes. In addition to its other activities the association takes an active part in the promotion of pure-food laws, and always holds itself in readiness to investigate and remedy, if possible, any abuses in the canning industry that may be reported to it.

A typical example of the kind of service the association gives is the case of a canner who forwarded to the laboratory samples of canned fish which, when opened, were found to be covered with minute black specks. The association chemists found that the specks were due to the salt used in seasoning the fish, and that they were harmless, although they spoiled the looks of the product. The salt had not been dissolved properly and had been made black by coming in

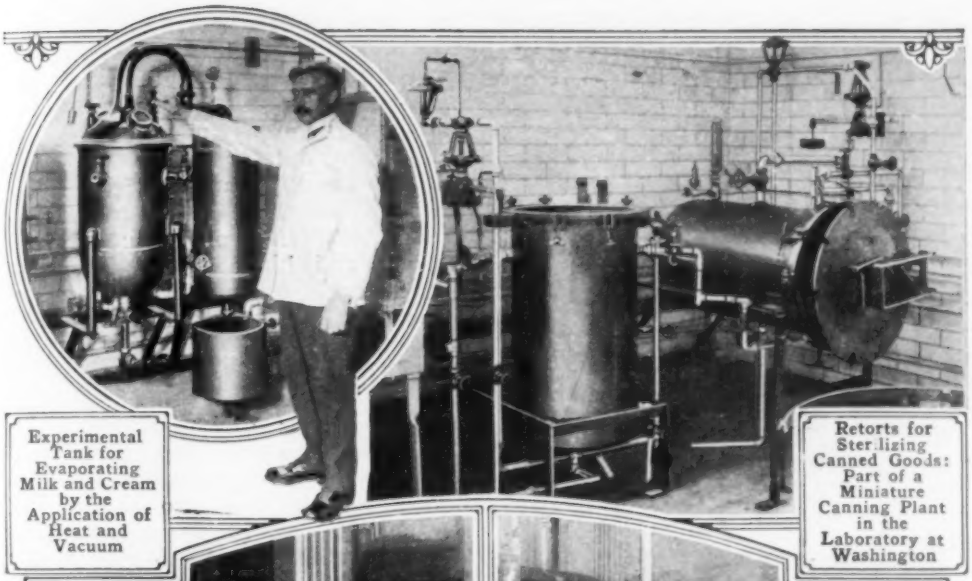
contact with the tin. The chemists instructed the canner as to the best methods of adding the salt, and no further trouble was experienced. A fatal case of poisoning resulting from the eating of canned tomatoes was reported to the association. The chemists found that death had been caused by rat poison placed in the tomatoes and the investigation resulted in the conviction of the murderer. Canners occasionally experience difficulty because of the water which they use, some of the so-called "hard" waters having a marked effect on canned goods, even to the extent of changing their chemical composition. When trouble of this kind is encountered an analysis of the water is made at the laboratory and the canner is told how to avoid the difficulty. Whenever an investigation is of benefit only to the individual canner the cost of the laboratory work is charged to him, but if the findings are of interest to canners generally, it is done free of charge, the work of the association being supported by dues paid in by the members.

Sterilization, which has entirely replaced chemical preservatives, is the most important as well as the most difficult feature of modern canning. Not only do different meats, vegetables and fruits require different treatment, but the same vegetables and fruits raised in different parts of the country require the application of different degrees of heat. Unusual problems in sterilization come up continually in the laboratory work. A Virginia canner used for a part of his product tomatoes grown on a soil heavily fertilized with a commercial fertilizer. These tomatoes alone out of all those canned at the factory could not be sterilized so they would keep after being canned unless they were subjected to a temperature of 235° F. When analyzed, this unusual case of spoilage was found to be caused by a hardy spore-bearing bacterium that had evidently been introduced into the district by the commercial fertilizer.

Spoilage of foods, whether canned or not, is caused by bacteria, yeasts, and molds, and the sole purpose of sterilization is to kill these elementary forms of life. While there are many kinds of bacteria, they may all be divided into two classes so far as the canning industry is concerned—one class comprising all bacteria that can be killed at or below the temperature of boiling water, and the other class comprising all bacteria that require a higher temperature than this. The latter is one of the things that make home canning frequently a failure, since sterilization at temperatures higher than 212° F. cannot be accomplished with ordinary cooking utensils, but requires the use of a closed retort and special apparatus for applying the steam. Experiments made at the laboratory indicate that the hardiest known bacteria, with the spores by which they are propagated, are killed at 250° F., if this degree of heat is applied to them directly for a period of 20 minutes.

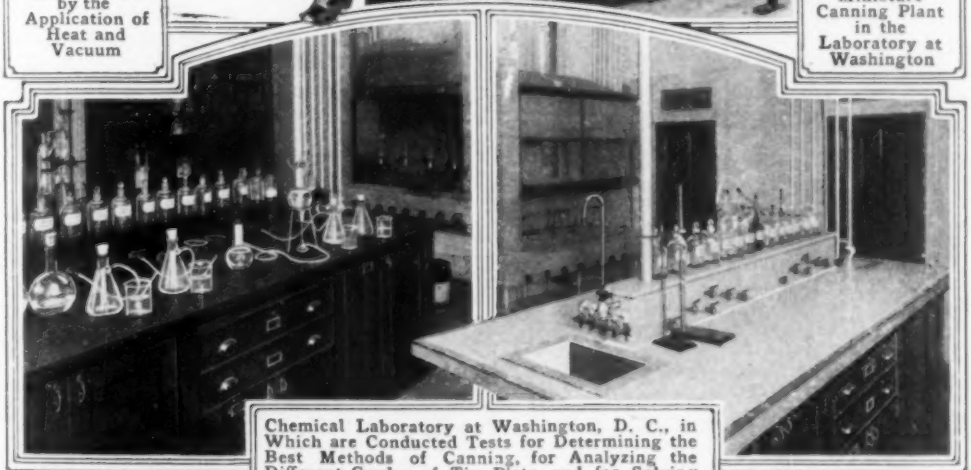
A modern cannery is a well-organized and sanitary establishment far different from the rough shed, housing crude machinery and processes, that was formerly thought to be sufficient. The location and surroundings of the typical cannery must be sanitary, away from manufacturing establishments that produce noxious odors or organisms of decomposition. The yards and drives about the establishment are cleaned daily and the drainage of the premises is good. The interior of the cannery is kept clean, and in contrast with the old type of cannery, there is provision for plenty of light and ventilation. In short, the modern canning establishment is not only designed to turn out canned food-stuffs under sanitary conditions, but to provide healthful working conditions for its employes. In most of the process handwork has been superseded by machinery.

The first requirement in all good canning is that the raw material be delivered to the factory in good condition, fresh from the field or orchard, and so packed or crated that it can be

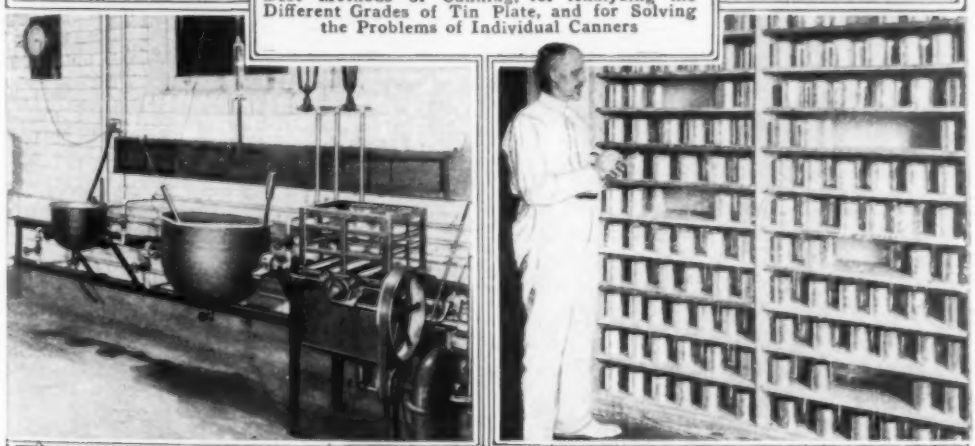


Experimental Tank for Evaporating Milk and Cream by the Application of Heat and Vacuum

Retorts for Sterilizing Canned Goods: Part of a Miniature Canning Plant in the Laboratory at Washington

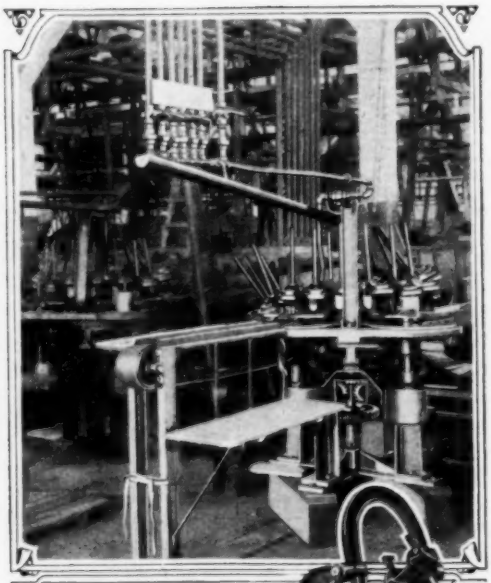


Chemical Laboratory at Washington, D. C., in Which are Conducted Tests for Determining the Best Methods of Canning, for Analyzing the Different Grades of Tin Plate, and for Solving the Problems of Individual Canners

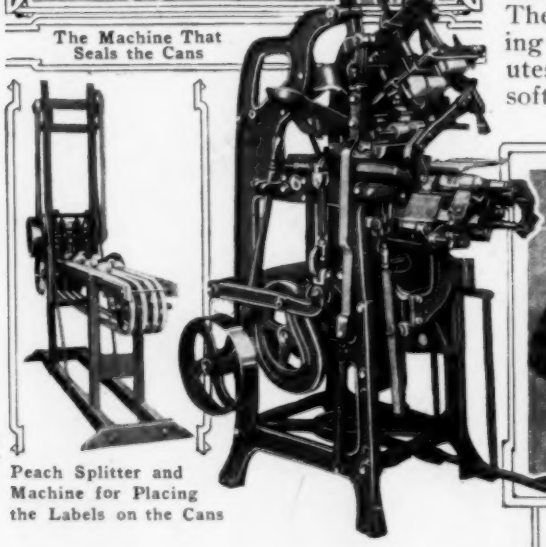


Experimental Sterilizing Device and Steam-Jacketed Kettles for Cooking Jams, Jellies, and Preserves

After being Stored in the Laboratory for a Specified Time the Cans are Opened and the Contents Tested

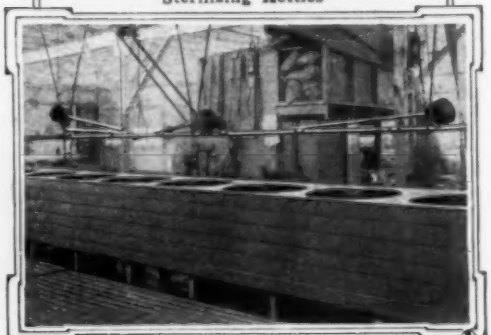


The Machine That Seals the Cans



Peach Splitter and Machine for Placing the Labels on the Cans

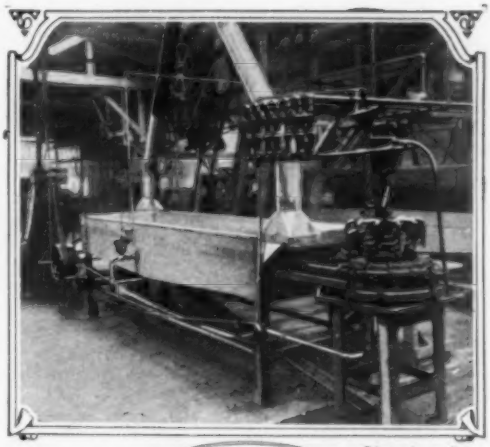
Rotating Disks That Remove Pumpkin and Squash from the Rind. Below: Battery of Steam-Jacketed Sterilizing Kettles



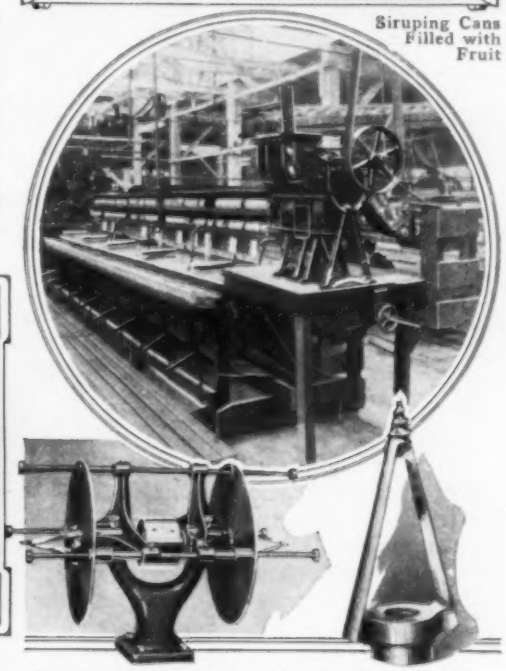
the cans. Such fruits as peaches, apples, and pears must be peeled and cut into pieces of the right size. This operation, formerly done by hand, is now performed by machinery in all well-equipped establishments. Nearly all vegetables require special treatment of some kind. Peas are shelled, graded for size and quality, and washed and blanched by automatic machinery. Corn must be cut, silked, brined, and cooked. Beans must be snipped and strung, graded for size, and blanched. Asparagus must be cut into lengths and blanched, while sweet potatoes and beets must be peeled and graded. Blanching consists simply in parboiling and is not done primarily for the purpose of whitening, as might be supposed from the name, but to improve the quality. The vegetables are dropped into boiling water for from one to five minutes, with the result that they are softened and much of the mucous sub-

handled without injury. The first step is that of grading, which is usually done on belts or special table tops to expedite the work. All fruits and vegetables must be thoroughly cleaned, and this is ordinarily done by washing in a tank and then thoroughly cleansing with a spray. Many of the fruits require no special preparation other than sorting and cleaning, after which they are placed directly in

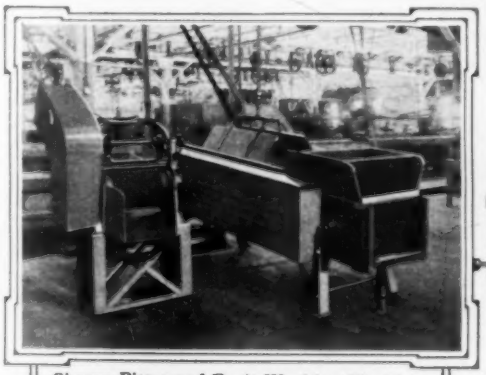
stance that has formed on the surface is removed. Washing and filling the cans is the next step in the process, and the filling is done by machinery except in the case of products such as some fruits which cannot be handled by machinery because of the danger of crushing. Corn, peas, and other foods that are placed in the cans hot or are covered with a hot sirup, must be subjected to a treatment for exhausting the air, this process consisting in passing the filled cans through a steam box and heating the contents to from 160° to 180° F. Cans that require no solder are sealed by a special machine that crimps the lids into place at the rate of 1,800 an hour. For sealing cans with solder tops a machine is used that wipes the top, places the cap and applies the acid and solder in one series of operation, without the necessity for touching with the hands, at the rate of 5,000 an hour. As the cans pass from the capping machine they are dropped into a bath of boiling water to test for leaks. Any imperfections in the can or the sealing will be shown by bubbles issuing from the opening. The final step in the process is that of sterilizing, which is done after the can is sealed, and while this process is one on which the success of the whole work depends, it comes in the end simply to a matter of applying the right amount of heat



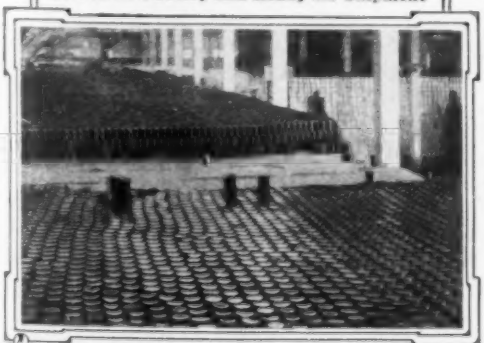
Siruping Cans Filled with Fruit



Machine That Distributes Cans to Filling Machines. Small Machine Shown at Bottom Is a Cabbage Corer



Cherry Pitter and Fruit-Washing Machine. Below: Thousands of Cans of Salmon Stored in Factory and Ready for Shipment



for the right length of time. With the product sterilized there is nothing left to do but apply the labels, which are placed on the cans at high speed by a machine. Modern canning standards require that the label shall tell the truth.

The average consumer is getting farther and farther removed from the sources of food supply, and as a rule, can no longer raise his own fruit and vegetables or buy from a neighbor's garden. This is especially true of the great cities, where so-called "fresh" products are often as much as a week old before they reach the consumer. The cannery makes it possible for the consumer to have such products fresh, not only "in season" but at any time of the year. One of the features of the enormous increase in the production and use of canned foodstuffs is its effect as a means of conserving our food supplies. It is becoming increasingly unnecessary to leave fruits and vegetables rotting on the ground for lack of transportation to the great central markets. Practically every district now has its cannery, centrally located so that the products of the garden and orchard can be delivered to it in fresh condition. Owing to the large scale on which canning operations are conducted, with resulting economy and efficiency, waste is largely eliminated, and many canned foodstuffs can now be served in the home at less cost than the fresh article. A can of whole apples weighing 35 oz., for example, usually retails for 10 cents. In a government report it is estimated that apples bought in this way cost less than apples bought by the peck at the rate of $2 a bushel. Many vegetables, such as corn and peas, can be bought in fresher condition and more cheaply in cans than in bulk, especially in the cities.

One of the disadvantages heretofore experienced in using canned goods was that the cans were too large or too small, with resulting waste in many cases. This fault is being remedied by the canners themselves through the introduction of cans of intermediate sizes. The attempt is being made, in particular, to provide cans that will hold just enough of different foods to serve for a meal for an average family of three or four without the necessity for any waste.

The biggest thing, after all, in the whole question of canned foodstuffs is its meaning to the housewife. When every kind of food can be obtained in as good and palatable condition in cans as in the fresh state, nine-tenths of the drudgery of the kitchen will have been eliminated. This condition has already been so nearly reached that the whole question is now practically up to the housewife. She must learn to make intelligent selection and to buy in packages of such size as to suit the needs of her own individual family. If the greatest economy is to be secured, she must buy by the dozen or the crate. She must learn costs and acquire the ability to watch the markets and take advantage of favorable cost conditions just as she would if she were conducting a commercial business. From present indications it is the acquisition of skill in these things, rather than skill in cooking, that will constitute the education and determine the efficiency of the bride of the future.

QUARTER-MILE RAILROAD EARNS $1,000,000

The shortest railroad in America and at the same time one of the most profitable is the Grand Island Railway, which constitutes the only rail link in the transcontinental trade route that connects Fort McPherson, on the arctic circle, with settled parts of Canada.

This curious railroad is owned and operated by the Hudson's Bay Company. It is a quarter of a mile long and cost less than $800 to build, the rails being of wood, with strap-iron facings. The rolling stock consists of two dilapidated flat cars which are pushed

Freight Piled Up at the Lower Terminal of America's Shortest Railroad, Waiting for Scows to be Hauled Up for Loading

At Right: The Entire Rolling Stock of the Road that Earned $1,000,000 on an Investment of $800, on Grand Island in the Athabasca River

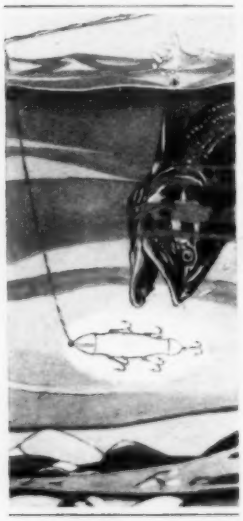
by hand along the rails. The freight rate for all classes of commodities is $2.50 a ton, and some idea of the volume of traffic can be had from the fact that in its 60 years of operation the Grand Island Railway has earned profits of more than a million dollars.

The secret of the road's commercial importance and success lies in the fact that it is the only means, other than "toting," whereby freight can be taken safely past the Grand Rapids of the Athabasca River. Except for these rapids, the river offers the shortest and safest route for the transport of trade goods into the interior and the bringing out of the furs for which the northbound freight is traded to the Indians. A hundred thousand dollars' worth of furs may be loaded on a single scow at times, and the risk of loss is too great to justify an attempt to get the boat through without unloading.

The rapids have a fall of 65 ft. in a quarter of a mile, and while they can be "shot" by expert rivermen, few ever attempt it with a loaded scow. The railroad occupies a narrow island in the middle of the river. The scow crews handle all their own freight, running the empty craft down through the rapids after the cargo has been piled on the flat cars. At the lower end of the falls ropes are thrown to the men in the scows, which are hauled up against the current to the island by a winch. Up-bound boats are sometimes towed up the rapids, after discharging their freight, or carried up on the railroad for a fee of $10.

ELECTRIC MINNOW NEW BAIT FOR GAME FISH

Intended for deep-water trolling for game fish such as bass, muskellunge and pike, as well as for night fishing, an electric minnow has been made which represents a new kind of artificial bait. The inventor conceived the idea of a luminous bait by the fact that examination of the stomachs of these fish showed that they ate fireflies and other phosphorescent insects. The minnow is made of tin, celluloid, and a couple of pieces of cedar. Inside it is a miniature electric bulb, which is connected by a fine, insulated wiring that is held in the line. The fisherman carries a small dry battery in one of his pockets to which the wires are connected. A switch on the pole near the reel allows the light to be flashed intermittently, as a glowworm, so as to attract the fish. The hooks carried on the sides of the bait are detachable.

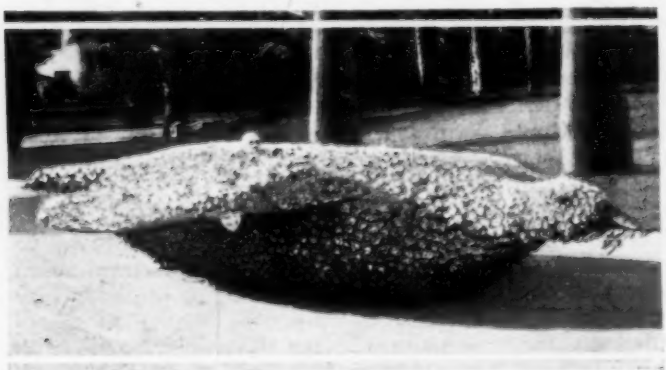


GREAT SPEEDWAY PROJECTED FOR TWIN CITIES

Financial arrangements have been made for the construction of a two-mile concrete speedway for St. Paul and Minneapolis, Minn., which if built in accordance with the present plans will be the greatest of its kind in America. A half section of land lying 4½ miles from the courthouses of each of the cities has been purchased for the site, where it is expected to expend $1,250,000. The track will be 80 ft. in width, with a 50-ft. graveled safety zone on either side, and have a base of 12 in. of rock and 6 in. of concrete, laid in two layers. The grade of the course will run from 2 per cent on the straightaways to 35 per cent at the turns. The grandstand will be 3,225 ft. long and seat 76,450 persons, while the bleachers will accommodate an additional 30,000. Facilities will be provided for more than 50,000 motor cars.

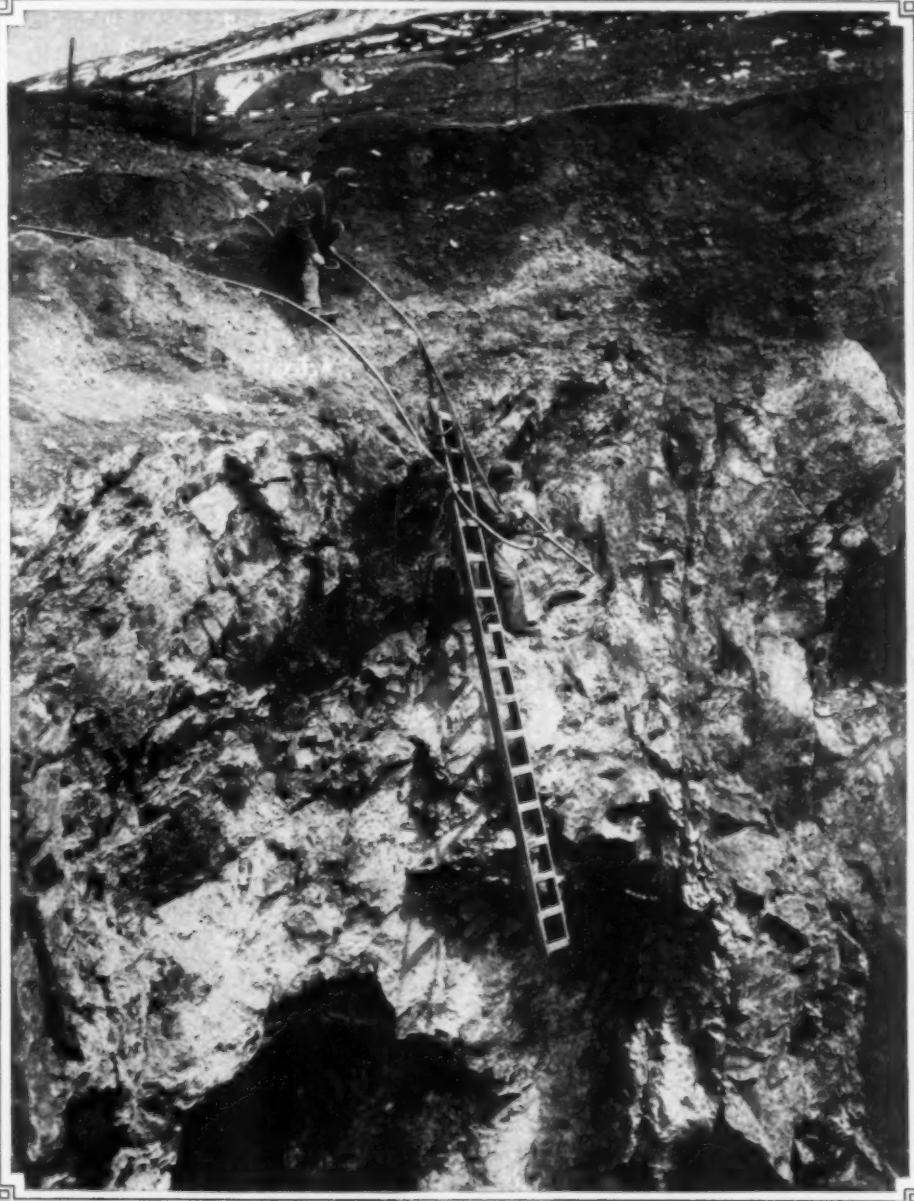
ROSE-COVERED PEACE DOVE IN FLOWER PAGEANT

One of the spectacular entries in a recent "Tournament of Roses" at Pasadena, Cal., was a "dove of peace," which was built over a small motor car. The framework forming the bird was completely covered with white roses and hid from view every part of the car except the two rear wheels. It was made with outstretched wings and held a green olive branch in its beak. The operator of the car was dressed in white and sat in such a concealed place that unless one looked carefully the "bird" seemed to be moving slowly along without human assistance.



The Driver of the Car was So Nearly Hidden from View That the Dove Seemed to Move along the Street Unassisted

GLORY-HOLE DRILLING IS A HAZARDOUS JOB



COURTESY OF MINING AND ENGINEERING WORLD

OPEN-PIT or "glory-hole" mining, as it is termed, is in some respects even more hazardous than working in underground tunnels. Tripod drills for boring the blast holes in the sides of the cut are out of the question, since there is no base on which to place them, so the miner must use jack-hammer drills held in the hands. The photograph shows a miner drilling a six-foot hole with a jack-hammer drill in the glory hole of a Montana copper mine. The bottom of the hole is 75 feet below the surface and the slightest misstep would be fatal. Hollow drills worked by compressed air are used. The blasted rock falls to the bottom of the open pit.

GIANT MANIKIN IS MADE TO SING AND TALK

Having the ability to sing, carry on a monologue, wave her arms and move her eyes in a circular orbit, a feminine manikin, nine feet in height, has been built by a Chicago decorator. The figure, a burlesque of the prophetic superwoman, is composed chiefly of wood, wire mesh, and wax, over which are added hair, paint, and silk. Concealed within the body is a phonograph and an ingenious arrangement of wires and cords so strung as to provide for the ready movement of the head, arms, and eyes of the manikin. With perfect facial composure the creature will sing selections from "Aïda," or whistle a street song while wildly swinging her arms about her head. Likewise the eyes may be moved soulfully to suit the particular selection which is being rendered.

AIRMAN GERSTNER'S DEATH CAUSED BY DROWNING

According to the testimony given by Captain Muller at the investigation of the aeroplane accident in which Lieutenant Gerstner of the U. S. Army lost his life near Oceanside, Cal., on Dec. 22, 1914, death was caused not by the fall of the biplane in which the two were riding, but came about as a result of the latter's attempt to swim ashore after the craft had made a landing on the sea. As the biplane fell Captain Muller, who was acting as pilot, kept sufficient control to bring it to a safe landing on the water, about half a mile from a deserted section of shore, but with the nose pointing seaward. An attempt was made to tear away some parts of the machine that would serve as floats to assist the airmen in swimming ashore. To do this required tools, which could not be obtained, as they were stored in a box securely wired to a submerged part of the craft. Lieutenant Gerstner then attempted to swim ashore unaided. After he had gone about half the distance he disappeared under the water. Captain Muller tied himself to the elevator wires of the biplane and was eventually rescued by boatmen.

STEEL FOR SOLDERING CAPS ON TIN FRUIT CANS

For use in small canneries, domestic-science schools, and homes in which a considerable quantity of fruit or vegetables is canned, a small self-heating capping steel has been devised for soldering the covers on tin cans. The ordinary steel requires continual reheating, while the new device, which is made round so that it applies solder in a circle matching the circumference of the cap, has a small gasoline burner attached above it which keeps it constantly heated. The apparatus is intended to be clamped to the edge of a table in such a position that a can may be easily slipped beneath the capping steel. The soldering operation requires but a moment's time.

¶A metal X-ray tube, provided with a window through which to concentrate the rays, has been invented.

TELEPHONING BY WIRELESS FROM MOVING TRAINS

At Right: Wireless-Telephone Equipment as Installed in the Railroad Station

Station at Binghamton, New York, with Aerials for Wireless Communication with Moving Trains

Sending Wireless-Telephone Message from a Moving Train: To Listen, the "Listening Key" is Depressed, and When Speaking This Key is Released. Power is Supplied by a Generator Carried in the Baggage Car

COMMUNICATION by wireless telephone between moving trains and the stations of a railroad, heretofore considered one of the hardest problems in the whole wireless field, has been brought to practically a working basis on two of the railroads of this country —the Lackawanna and the Union Pacific. One of the interesting things about this latest development in wireless is that while they accomplish practically the same purpose, the systems developed on the two railroads differ radically in most of their essential features.

On the Lackawanna Railroad the wireless waves are transmitted directly between antennae carried on the train and the aerial at the railroad station, whatever the distance may be, while the system developed on the Union Pacific utilizes for distance transmission two wires strung on the telegraph

poles that parallel the track, so that the wireless waves are only required to bridge the gap between the telegraph line and the antennae carried on the train, a distance that rarely exceeds 75 ft. and is usually less than 50 feet.

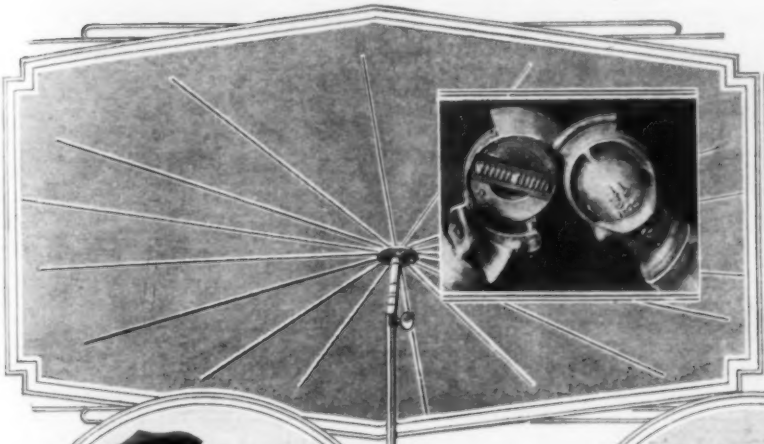
That the system used on the Lackawanna is a success has been demonstrated by telephone conversations recently carried on over a distance of 27 miles between a limited train running at high speed and a wireless station at Binghamton, N. Y. The aerial carried by this train consists of four wires stretching over four coaches and running parallel with the roofs. When the train is made up, the wires of the four coaches are connected together so that the entire antennae system is close to 300 ft. in length. The telephone equipment is placed in a small booth at the end of the smoking car, while a small generator that supplies current for the transmitter is installed in the baggage car. This generator is driven by a turbine that takes its steam from the locomotive and exhausts down on the roadbed. Instead of the direct current ordinarily used in wireless-telephone transmission, a 110-volt alternating current at a frequency of 6,000 cycles is employed. The operation of this system is so simple that there is no necessity for the presence of an expert on the train. When the oscillator that sends out the wireless waves is once adjusted it is locked so that it cannot be tampered with. To listen, the "listening key" is depressed, and when speaking this key is released. Conversation at a distance of 27 miles is loud and clear, although somewhat affected by the noise of the train, while the sounds of the voice have been heard at a distance of 52 miles with the train running at 50 miles an hour. It is now planned to use an ingenious device by which conversation from the train can be relayed to the telephone lines of the city in which a wireless station is located. With this device the voice of the person speaking from the moving train will be registered on a phonograph record and instantly reproduced and relayed over the telephone wire to the local telephones.

The system worked out on the Union Pacific is designed for talking both by wire and by wireless. It is used for communication between the different cars of the train, and it is then operated as an ordinary wire telephone with selective talking and signaling. When the train is stopped at a station, the equipment is connected with the wires of the telegraph line and is operated as a single long-distance telephone system. With the train in motion, the wireless is brought into action simply by starting the generator carried in the baggage car, and it is then possible to talk with a train ahead or behind, or with a fixed wireless station. The wireless waves thrown out by the apparatus are taken up by the two wires strung on the telegraph poles, these wires having been balanced and equipped with condensers. Over the wires the electric impulses are transmitted direct to the telephone equipment of the railroad stations, but at every point wireless impulses that can be picked up by another train are also thrown out by the wires, and it is this that makes communication between trains possible.

For connecting the equipment and making it continuous through the train, a copper wire woven into the air hose and grounded through the wheels at each end is used, the hose couplings being provided with metallic connections that interlock in firm contact when the couplings are made.

CIGAR WITH WOODEN PEG INSERTED IN TIP

A cigar manufacturer in Wisconsin equips each cigar with a small wooden shoe peg inserted in the tip and projecting far enough to be easily grasped by the teeth. Instead of biting off the end of the tip the smoker simply takes hold of this peg with his teeth and pulls it out, and in this way opens a good draft through the cigar without loosening or injuring the wrapper.



A Copper Wire Woven into the Air Hose Runs through Each Car, and These Wires are Connected by Electrical Contacts in the Couplings. The Umbrellalike Antenna Forms Part of a Wireless-Telephone Apparatus Installed Indoors and Shown in Operation Below

With the Ribs of the Umbrella Acting as Antennae, This Brakeman is Receiving a Wireless Message from a Station Located Several Hundred Feet Away

This Electric Truck, Used for Experimental Purposes, was Run Forward and Backward at Varying Speeds by the Manipulation of the Key in the Wireless Station

Locomotive Equipped with Aerial and Used in the Union Pacific Experiments

Rescuing Fish Trapped in a Shallow Pool by the Receding Flood Waters of the Mississippi River

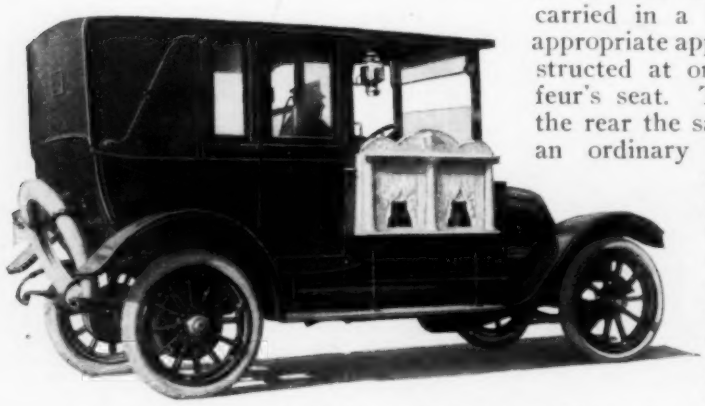
RESCUING FISH TRAPPED BY RECEDING FLOOD

Each year when spring freshets swell the Mississippi River, spreading it out over the lowlands for miles in every direction, millions of fish are carried out of the channel. When the flood waters subside the fish are trapped in shallow bayous and ponds. In order to prevent what was once a tremendous loss, the government has established fishery stations at different points along the river and sends its men into the field annually to rescue the fish trapped in this manner. The accompanying photograph shows one of the gangs seining in a shallow pool in which the fish would have died within a short time had they not been released. The greater percentage of the fish, the "fingerlings," are returned to the river, while millions of them are carried to the interior rivers which are in need of restocking.

¶Preliminary surveys are being made for a bridge across the Hudson River from New York City to New Jersey. The cost will be $42,000,000.

TAXICAB HEARSE IS USED FOR INFANTS' FUNERALS

Taxicab hearses are the rather uncommon vehicles that have been introduced at Chicago for use at children's funerals. One of these cars is designed so that an infant's casket may be carried in a boxlike receptacle of appropriate appearance, which is constructed at one side of the chauffeur's seat. The mourners ride in the rear the same as they would in an ordinary taxicab. From the driver's side the appearance of the car is no different from that of any ordinary motor vehicle. The vault in which the casket is carried is decorated in white and is similar to the full-sized hearses in style.



Taxicab Hearse, a Funeral Vehicle Designed to Carry a Child's Coffin

EXPLODING GUNPOWDER WITH WIRELESS WAVES

According to reports coming from Japan a wireless apparatus for exploding gunpowder at a distance proved successful in tests recently conducted at Kumamoto. Nothing is known of the apparatus except that it is intended "for the manipulation of wireless electric waves." For making the tests a double stockade was erected, a pound of explosive inclosed with wire netting was placed in one corner of the stockade and the exploding apparatus in the opposite corner. When all was ready the inventor pressed a key and, according to the reports, the explosion followed instantly. The distance was short, but the inventor claims that using the apparatus at greater distances is only a matter of greater power.

MOTOR-DRIVE ICE BOAT ATTAINS GOOD SPEED

On smooth ice a three-runner ice boat which during the winter has been used at Battle Creek, Mich., has attained a speed of 55 miles an hour with a twin-cylinder, 3-hp. motor, driving a 4-ft. 3-in. aerial propeller. The craft is guided by the fore runner, which is turned with an ordinary steering wheel. Beneath the driver's seat is a

Homemade Ice Boat Driven by a Three-Horsepower Motor

steel claw which digs into the ice and serves as a brake when pressure is applied with one foot on a lever at the front.

ADJUSTABLE WORK TABLE ON KITCHEN CABINET

A kitchen cabinet with a working table so devised that it may be readily adjusted to any convenient height

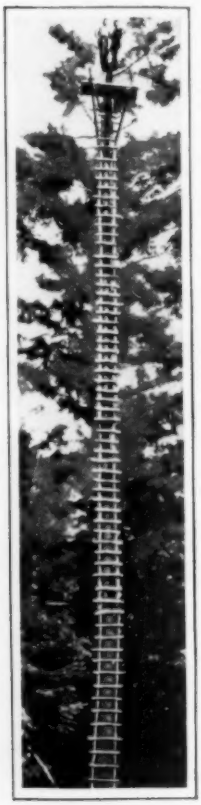
By Turning a Crank This Kitchen Cabinet may be Adjusted So That Its Working Table Is of Proper Height for Its User

has recently been invented. In general appearance it is similar to ordinary cabinets. At one side, however, it has a small crank that operates a ratchet-and-pawl mechanism which controls the working table, allowing it to be raised or lowered to suit its user. In this way a short woman, or a tall one, may have a cabinet which suits her height as satisfactorily as if it had been made to order. The adjustment may be made in a few seconds, and once fixed, the cabinet requires no further attention. It is as substantial as if it were of a fixed height.

CX-ray photographs on metal plates and celluloid films are being used by French military surgeons, being less likely to be broken than the glass plates.

LOOKOUT POSTS IN FORESTS OF MONTANA AND IDAHO

On many of the mountain peaks throughout the timbered areas of western Montana and northern Idaho, lookout points connected by telephone to the various permanent stations and patrol camps have been established by government forest rangers in order to facilitate the detection of fires at their inceptions when it is possible to curb them. In numbers of places where for some reason it has been impossible to construct regular stations, use has been made of the tallest pine trees. On each of these the branches have been stripped from one side, a ladder built up the trunk, and an observation platform constructed at the top. From such a point it is often possible, by the use of binoculars, to view the surrounding mountains for many miles. In this manner a vigil is kept over many of the most remote sections of the forests.

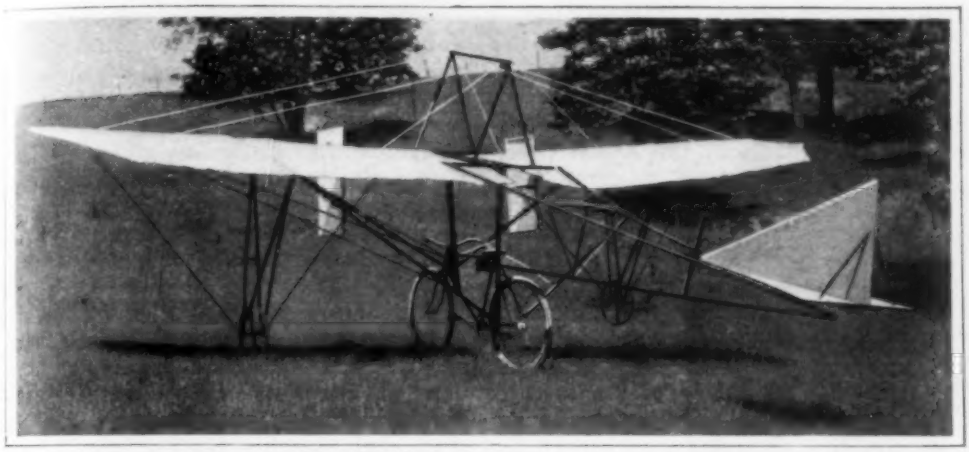


INSTRUCT MEXICAN LABORERS WITH THE PHONOGRAPH

The phonograph has been put to a novel use on a western railroad which employs many Mexican laborers who understand no language other than Spanish. To reach these laborers a "safety-first" talk was translated into Spanish, and a phonograph record of it made. A phonograph is carried on an inspection car and each Mexican gang of laborers is made to listen to a nine-minute talk in their own language. Extra records are carried, and whenever a bunk car is found with a phonograph as part of its equipment, a record is left so that the laborers may hear it repeatedly. In addition to these records the car also carries a number of Mexican musical records. When the car stops for the night at a point where a work train is tied up, a concert lasting for an hour is given for the benefit of the Mexican laborers and their families, and this concert invariably ends with the "safety-first" talk.

"TRIAL OF THE PYX" HELD AT PHILADELPHIA MINT

Periodically the coinage of all the United States mints is examined by the Federal assay commission, a custom which is also followed in other countries, and in England dates back to the time of Henry II. The procedure is known as the "Trial of the Pyx," a name derived from the sealed box, or "pyx," in which the coins to be examined are kept. In America it is the custom to preserve two coins out of each shipment amounting to $1,000, for examination by the commission. This inspection is made to ascertain whether the coins are up to standard in quality and weight, which means that many of them are subjected to both chemical and filing tests. In the course of this work, some of the coins are cut in half, as is shown in the accompanying photograph taken at the Philadelphia mint recently while the coin jury was undertaking its work.



By Pedaling the Bicycle Part of the Way down a Knoll, the Glider may be Shot into the Air so That It Skims Along for Several Rods

HOMEMADE GLIDER BUILT FROM SCRAP MATERIAL

From odds and ends of scrap material available for his use, an Ohio farmer boy has constructed a monoplane glider attached to a bicycle which fills quite adequately the purpose for which it is intended. To cover the framework of the wings, which are made principally of laths, its builder made use of pieces of canvas that had been used over tobacco-plant beds. The bracing wires were taken from an old fence, and a few other members were likewise reclaimed from scraps. By pedaling the bicycle rapidly part of the way down one side of a knoll, the rider is able to gain sufficient momentum for the glider to take to the air when its nose is pointed upward. By means of wires extending from the handlebars to the outer tips of the plane, the wings are warped and the craft guided.

SURF COASTERS INTRODUCED AT CALIFORNIA BEACHES

Surf coasters have made their appearance on the beaches of southern California and are being used there by the bathers in much the same way as surf boards are in Hawaii, and some other parts of the world where conditions are favorable for them. The coaster is shaped much like a toboggan, curving up at the prow in a generous scroll, and instead of being made from a solid slab of wood, it has a light frame covered with canvas. This furnishes it with a large air compartment, gives it buoyancy and makes it very simple to handle in the water. No skill is required in learning to ride the device, as in the case of the surf board, and for this reason it has gained popularity among winter tourists.

Toboggan-Shaped Coaster Which is Used for Surf Riding at California Beaches

DESIGN OF SCOTT MEMORIAL DECIDED UPON

As a memorial to Capt. Robert F. Scott, commander of the ill-fated British expedition to the south pole, a monument symbolizing his patriotism and fortitude, as well as theirs who died with him in the antarctic region, is to be raised in London. The design for this structure was recently selected by a special committee which considered the models submitted by various sculptors. The place of erection probably will be in Waterloo Place, in the heart of the city. The work consists of a granite pylon, at the top of which is a group of figures representing "Courage" supported by "Patriotism," disregarding "Fear" and "Despair." The names of the five explorers who failed to return appear on the front of the pylon, while other inscriptions are engraved elsewhere. A podium at the base carries on each of its four sides a bronze relief of the principal incidents of the expedition, with an inscription reading, "To Strive, to Seek, to Find, and Not to Yield."

COURTESY OF THE SPHERE

AERATORS FOR NEW YORK WATER SUPPLY

A spectacular feature of the new water-supply system of New York City will be the devices used for aerating the water, one of which is being installed at Ashokan and the other at Kensico. With these the water will be aerated just before entering the aqueduct and again before being distributed to the city mains. Each aerator consists of a basin covering nearly three acres, measuring 460 ft. in length and 240 ft. in width at the widest point. The floor of the basin is studded with 1,600 nozzles arranged in rows, and when the aerator is in full operation each nozzle will spout a jet of water from 15 to 20 ft. high. From each nozzle the water will issue in a fan-shaped, whirling fountain, and owing to the close spacing of the nozzles, the jets will intersect and break up into a mass of spray, giving the air access to every particle of the water.

RAPID STEEL CUTTING WITH OXYACETYLENE FLAME

The oxyacetylene flame was used in cutting down all the steel street-awning frames on the main streets of Baltimore, which had been ordered removed before a specified time to comply with a city ordinance. This method proved to be a great time saver, an average of only about 15 minutes being required to clear away the frame in front of each establishment. In cutting down a frame, the two compressed-gas tanks, one containing oxygen and the other acetylene, were placed in convenient position on the sidewalk. The operator, armed with a stepladder and a cutting torch, attacked first the horizontal members and then the upright posts. The posts were cut off flush with the sidewalk, the edge of each cut being melted down so there would be no projection. The average cut was made in less than half a minute.

LAUNCHING A GIANT BATTLESHIP
A LONG-PLANNED AND RISKY JOB

By J. CROSBY McCARTHY

WHEN the "Pennsylvania," the biggest warship ever built in America, slid off the ways at Newport News on March 16 and floated safely in the waters of the James River, the huge craft passed successfully through the most critical stage of its construction—the launching.

To slide a steel structure as big as a 30-story office building downhill into the water and have it arrive right side up without damage is a big job, even in these days of big achievements. The builders of the "Pennsylvania" risked nearly $7,000,000 worth of material and labor when the launching triggers were released. The outcome depended on the correctness of calculations made before the big fighting ship's keel was laid on the blocks, for before the first construction work on a ship is begun the preparations for its launching must be started. It is comparatively easy to build a ship on land, but to get it into the water is another matter, as Robinson Crusoe discovered after working seven years to construct a boat which, when finished, proved so big that he could not launch it. After the "Great Eastern," for 43 years the largest ship in the world, was built in 1858, it took three months to get it afloat.

The larger the vessel, the more ticklish is the job of sliding it safely into the water. Although years of experience and careful study have reduced the methods used to a standard practice, yet there is always a degree of uncertainty about the operation. In spite of the navy's record of an unbroken series of successful launchings, those responsible for each succeeding one experience considerable anxiety until the crisis is safely past. Even though every known precaution has been taken, there is always the chance that some unknown factor may ruin the plan and wreck the ship.

Data compiled from previous launchings of similar ships serve as the basis of calculation. In the case of the "Pennsylvania" the experience with the "Oklahoma," launched a year before, was the guide. The "Oklahoma" is only 33 ft. shorter and weighs within 4,000 tons as much as the "Pennsylvania."

The construction of the ways, which carry the ship a distance of a little more than its own length into the water, is the most important of the launching preparations. The term "ways" includes both the pair of inclined wooden tracks along which the vessel travels, known as ground ways, and the skids, or runners, that support its weight while moving, called sliding ways. The ground ways for a big battleship are about 5 ft. wide, 70 to 90 ft. longer than the ship, and spaced about a third of the ship's width apart. They are built up of yellow-pine timbers a foot square, bolted together and supported on cribbing. A cross section of the ground ways shows a concave upper surface, the outer edges being about two inches higher than the center, and having wooden plates bolted to them to keep the sliding ways from slipping off.

The sliding ways are about two inches narrower than the ground ways and slightly shorter than the ship. Both the lower surface of the sliding ways and the upper surface of the ground ways are usually sheathed with 3-in. oak planking. Like the ground ways, the sliding ways are of foot-square timbers, bolted firmly, and above these is built up a packing of 4-in. pine planks, conforming to the curves of the ship's body and held in place by heavy iron rods and steel cables extending from the bulwarks completely around the hull. Between the sliding ways and the packing are placed oak wedges, 8 ft. long and 6 in. square at the thick end.

The "Pennsylvania," like most large ships, was launched stern first. This made it necessary to take elaborate precautions to insure against the crushing of the forward part of the hull at the moment when the stern floated, lifting the weight of the middle off the

ways and leaving the whole gigantic mass supported only at the two ends. This is one of the most serious dangers to be guarded against in launching a ship.

To prevent an accident of this kind, cradlelike supports, extending under the hull and known as poppets, are constructed. They consist of steel plates conforming to the curvature of the hull and supported by timbers resting on a curved rocker. Between the plates and the hull concrete is poured in order to insure a more uniform bearing. Between the two parts of the rocker grease is applied so as to lessen the friction when the vessel begins to pivot and pressure is brought on the poppets, which, because of their peculiar construction, serve as an axis when the stern starts to lift from the ways. The pressure brought on the forward part of the hull when the vessel pivots is so great that it is necessary to brace the hull from the inside where the poppets bear against it so that the plates will not be forced out of alinement during the launching. The sliding ways, poppets, and all of the packing, are tied to the vessel by means of ropes and cables, so that when the ship floats out into the stream it carries with it all of the cradle which supported it during the launching. When the ways are placed in position, a layer of stearin and tallow about three-quarters of an inch thick is placed between them. Iron plates, which are removed a few minutes before the launching, are placed between the ways at intervals of every few feet to prevent the lubricant from being forced out by the weight of the timbers.

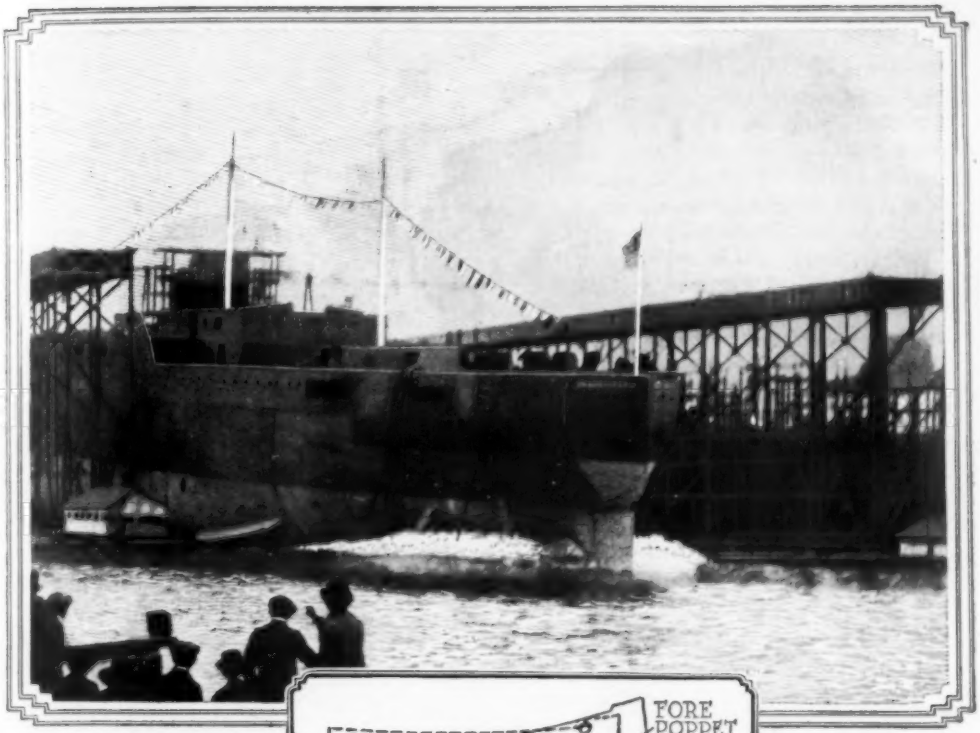
The day before the launching the shores and braces which have supported the ship during the course of construction are removed. Several hours before the launching a force of 200, or more, men begin to drive in the hundreds of wedges between the sliding ways and the packing. Heavy mauls and hydraulic rams are used for this purpose. This setting of the wedges serves to lift the weight of the vessel from the keel blocks so that it is supported by the ways. The keel blocks are then removed and the ship is ready for launching.

A few minutes before the time arrives to send the ship gliding down the ways for its initial plunge into the water, dogshores which hold the sliding ways fast are knocked out, and the pressure is transferred to hydraulic triggers fitted in each of the ground ways about amidships. The triggers, which are of heavy steel, project through holes cut in the ground ways, the upper ends engaging iron caps fitted into recesses in the sliding ways. The bearings for the triggers are bolted to the under sides of the ground ways, and the lower ends of the triggers rest against the pistons of hydraulic jacks at a pressure of about 1,700 lb. to the square inch.

At a signal, the safety struts of the hydraulic jacks are swung aside and the escape valve in the pressure pipe is opened. The pistons recede into the cylinders, the triggers release the sliding ways and the vessel is free to slide into the water. Sometimes it is necessary to employ hydraulic jacks at the forward end of the sliding ways in order to start the ship. At first it moves slowly, but the speed rapidly increases until it reaches a maximum of as much as 25 ft. per second. The speed of the ship down the ways must not be too great, otherwise the friction will set fire to the lubricant. If this happens the vessel is liable to come to a standstill before it reaches the end of the ways. In order to retard the speed, rope checks are employed. Temperature is an important factor. If the weather is warm, the lubricant between the ways will be soft and the speed much greater. In extremely cold weather it has been necessary, in some cases, to lay steam pipes along either side of the ways to warm the lubricant.

Motion-picture cameras were used to make observations of the launching of the "Pennsylvania." The pivoting of the vessel is clearly shown on the films and the data obtained will be of great value in future launchings.

Larger than any other fighting ship ever built in America and exceeding



The Battleship "Pennsylvania," Largest Ship Yet Built for American Navy, Sliding into the Water at Newport News

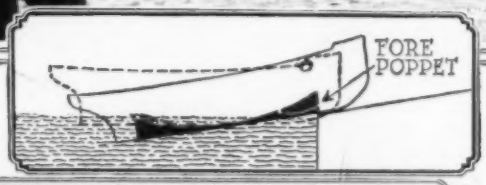
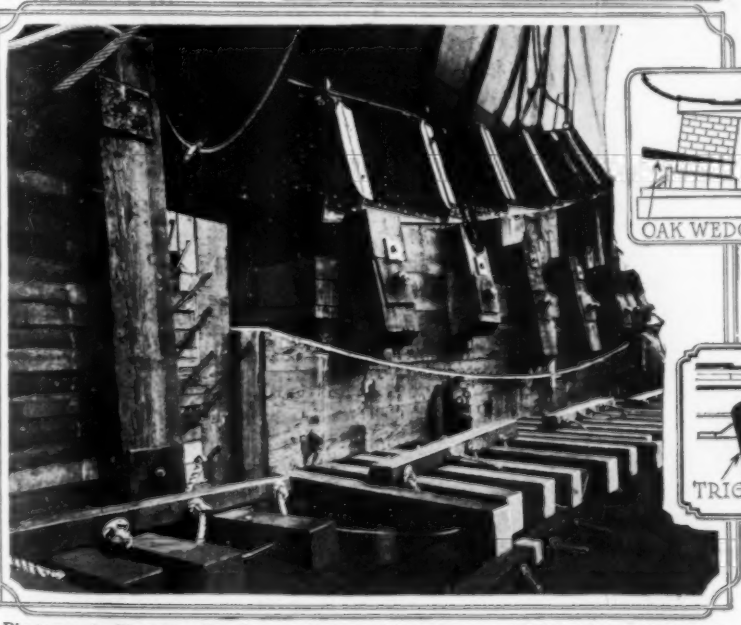
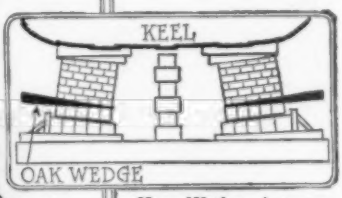


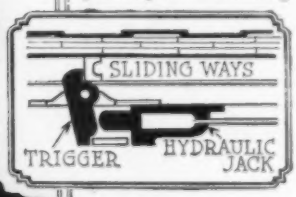
Diagram Showing How the Launching Poppet Serves as a Pivot When the Stern of the Ship Floats and the Angle of the Keel Changes toward the Horizontal



Photograph Showing the Forward Launching Poppet, Which Bears the Ship's Weight and Enables It to Change Its Position from Slanting to Horizontal. Note the Wedges between the Packing and the Sliding Ways



How Wedges between Packing and Sliding Ways Lift the Ship off the Keel Blocks Preparatory to Launching



Steel Launching Trigger Held in Place by Hydraulic Jack. When This is Released the Ship Begins to Slide to the Water

every other ship of any nation in the combined power of its great guns, the "Pennsylvania" was begun on Oct. 27, 1913, and will not be ready for active service until Feb. 28, 1916, so long does it take to construct a modern war craft. The new ship is 608 ft. long over all, 97½ ft. wide, 53 ft. 9 in. deep from keel to upper deck, and will draw 28 ft. 10 in. of water, displacing 31,400 tons. Curtiss steam turbines developing 32,000 hp. will drive its four screws, producing a speed of 24.2 miles an hour. Oil fuel will be used, the tanks in the ship's double bottom having a capacity of 694,830 gal. A band of 11-in. armor, extending nearly the entire length of the ship and 8 ft. below the water line, will furnish the main protection. The four turrets will have 15-in. armor. In each of them will be mounted three 14-in. guns, 52 ft. 6 in. long. The turrets are so placed that the entire 12 guns of the main battery can be fired in a single broadside, or six can be fired at once dead ahead, and six dead astern. The combined weight of shells thrown at once will be 7½ tons. The secondary battery will include 22 guns of 5-in. caliber and 21 ft. 3 in. long, four 3-pounders for saluting, two 1-pounder for boats, two 3-in. field guns for landing parties, and two standard .30-caliber machine guns for the marines to use in the fighting tops on the two skeleton masts placed fore and aft of the single funnel. When in commission, the "Pennsylvania" will carry a crew of 65 officers, 863 enlisted men, and 74 marines. The hull alone cost $7,260,000, and the completed ship, fully armed, will cost $13,000,000.

SOUND OF LIBERTY BELL IS PRESERVED

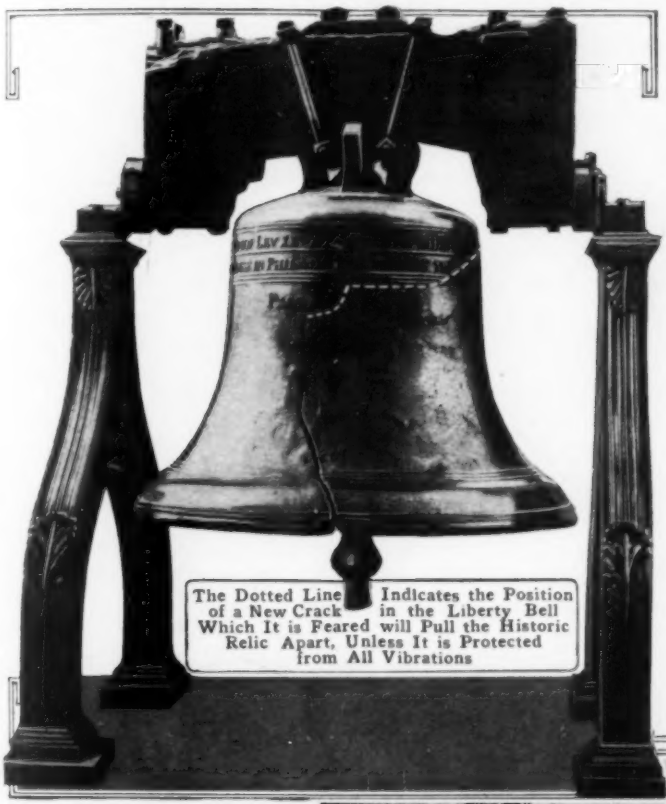
WHAT may prove to be the last ringing of the historic Liberty Bell took place in Independence Hall at Philadelphia recently.

Instead of sending the bell to the Panama-Pacific Exposition, it was decided to transmit its tones across the country to San Francisco over the recently completed transcontinental telephone line, partly fulfilling in a literal sense the prophetic words cast on the bell, "Proclaim liberty throughout all the land, unto all the inhabitants thereof." The bell was struck three times with mallets at intervals of five seconds. By an arrangement of three very sensitive transmitters which were suspended beneath it on rubber bands, so as to exclude all foreign vibrations, the tones were caught and clearly heard over the telephone wires on the Pacific coast. At the same time a phonographic record was made of the notes so as to preserve them for posterity.

This is the first time that the great bell has been sounded since it was cracked in 1835 while tolling the death of John Marshall, the first Chief Justice of the United States Supreme Court. The reason that it may never again be rung is that a new crack, more serious than the old one, has developed in it.

It has been found that the bell is afflicted with the "disease of metals." This is partly responsible for the appearance of the latest fissure and has made it necessary to support the weight on padded props in order to relieve the stress which has gradually been pulling it apart.

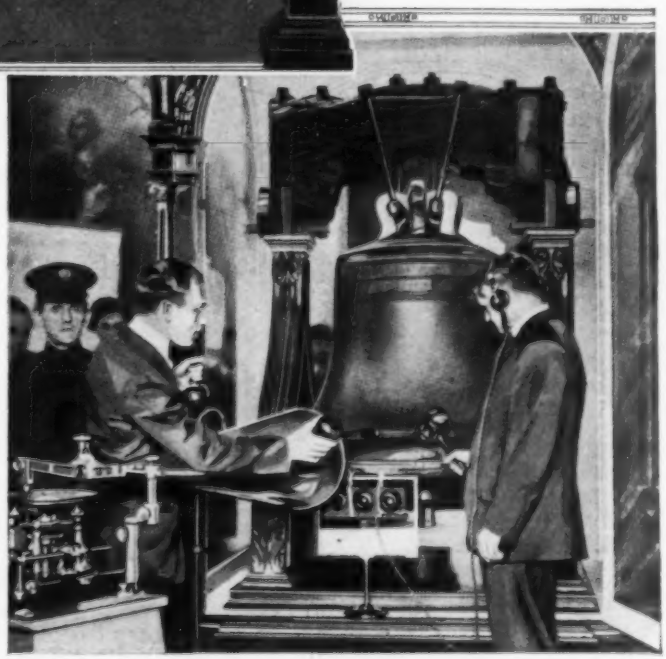
The new crack is now plainly visible, while only a short time ago it was microscopic. It begins at the upper part of the original fracture, extending from the letter "P" in the word "Philadelphia," diagonally a quarter of the way around the circumference, to the letter "y" in "Liberty," near the top. It is believed that the new crack might not have occurred had the bell been allowed to remain at rest after it was first broken. It has, however, been shipped on different occasions to New Orleans, Chicago, Atlanta, Charleston, Boston, and St. Louis. That it is actually suffering from a malady known



The Dotted Line Indicates the Position of a New Crack in the Liberty Bell Which It is Feared will Pull the Historic Relic Apart, Unless It is Protected from All Vibrations

as the "disease of metals," is the description of its ailment in the technical phraseology of the metallurgist, and is not a popular figure of speech. The reason for this distemper is to be found in the history of the bell's casting.

It was originally made by Thomas Lester at London, in 1752, and shipped to Philadelphia. When it was hung to try the sound it was cracked by the clapper. At first it was intended to return it to England, but subsequently two workmen, Pass and Stow, neither of whom was experienced in the art, undertook the recasting in Philadelphia. Obviously the bronze was too brittle, and in order to toughen it, they added approximately 10 per cent of copper to the original metal. When the bell was later rehung it was found that too much copper had been used, and, to the chagrin of everyone, the tone was destroyed. The same men again undertook the work, and this time are supposed to have added tin to restore the tone. The third bell was accepted, but too much tin had been used, and the tones were so highly resonant that it was seldom rung.



Ringing the Liberty Bell for the First Time Since It was Cracked Years Ago. Below Are the Transmitters Used in Sending the Tones across the Continent. The Horn at the Left was Employed in Making a Phonographic Record of the Tolling

FAULTY CONSTRUCTION OF MONOPLANE CAUSE OF LINCOLN BEACHEY'S DEATH

WHEN Lincoln Beachey, the airman, lost his life by a 3,000-ft. plunge into San Francisco Bay a few weeks ago, he proved his theory that the monoplane of today is not the logical machine for looping the loop and making spectacular drops from the clouds. His death resulted from the structural weakness of a new craft of this type, which was too light and poorly braced to withstand the stress of the 2,000-ft. perpendicular dive that he attempted to make in it. One of the wings crumpled while he was diving, head down, at a speed of probably three miles a minute.

The wing spread of the machine was only 26 ft. 6 in. It was not a German Taube, as is popularly thought, but a small tractor monoplane with ailerons extending back from the tips of the wings. The fuselage was short and the body made of aluminum, with an opening at the top just large enough to allow him to climb into the machine. Only the airman's head protruded above the hood when in flight. Beachey's fatal mistake lay in his overeagerness for a light machine, for he neglected to brace the wings even as substantially as is customary on high-power monoplanes intended merely for speed and straight flying. He relied solely on two sets of bracing wires, or stays; one on top and the other on the bottom—a total of eight wires. Two of these wires extended from the center pylon over the body to the outer part of each wing, while beneath, the wires reached from the same wing points to the running gear. In this connection attention has been called to an additional weakness in the bracing, caused by the crossing of the under stays. This would have a tendency to induce a strain which would bend the wings longitudinally at the spar, instead of holding them against such a pull. In view of French, German, and English plans of monoplane construction, the inadequacy of this system of bracing is glaring. Practically all German single-decked machines have three pylons, two of them midway of the wings, reaching through to form a similar post on the under side, and each carrying from six to eight wires both at the top and bottom of the plane, in addition to a truss extending nearly the full length under the front spar. And these machines are not intended for Beachey's type of flying.

Exactly what happened will never be known, but there is one theory that is quite plausible. Previously Beachey had performed his feats while seated on a slender outrigging at the front of his biplane where no part of his body was shielded from the air. Just as the marine navigator learns to measure the speed of his vessel by taking into account the effect of a heavy head wind, so did Beachey grow to estimate his speed by the force of the air against his body. When he seated himself in the cockpit of the new monoplane, however, covered his head with a tight-fitting hood and his eyes with goggles, this also for the first time, he was protected from the air in a way he never before had been. Therefore when he started on his long, head-first dive, after successfully looping the loop and flying upside down, he probably failed to realize that he was plunging toward the earth at a rate much greater than was his custom. There is no doubt about this point, for a monoplane meets less resistance than does a biplane and travels at a greater speed. In a few seconds his craft attained a terrific momentum and the stress was greater than it was capable of withstanding. The front spars of the wings were not braced against head resistance, neither were they reinforced with a truss, so, when he was within a thousand feet of earth and ready to straighten out and volplane to the green, the velocity of his craft was out of proportion to its strength and a wing crumpled under a stress heavier than formerly had been borne by the four wings of his biplane.

¶Chicago has an all-night movie theater.

Above, Lincoln Beachey is Shown Rising from the Ground at Start of Flight

This Shows the Demolished Monoplane being Pulled Out of San Francisco Bay After a Diver had Located It. The Body of the Airman was Taken from the Wreckage

Close View Picturing Wreckage of Air Craft After It had been Removed from the Water, Which It Struck While Falling at a Speed of About Three Miles a Minute

RADIUM FERTILIZER GIVES INCREASED CROP YIELDS

That radium as a fertilizing agent has a wonderful stimulating effect on plant growth and also imparts to vegetables grown under its influence added richness and sweetness of flavor has been demonstrated by Prof. H. H. Rusby of Columbia University. Doctor Rusby conducted two experiments with radium fertilizer, one on 100 acres of farm land at Northfield, Ohio, and the other on a 1½-acre garden plot at Nutley, N. J. In both cases the results were surprising.

The cost was not as great as might have been expected. It takes about 400 tons of radium ore to yield a gram of radium, and this quantity is worth, at the current market quotation, $120,000, equivalent to a price of more than $50,000,000 a pound. But the finely powdered residue of ore, remaining after all the radium possible has been extracted, still contains two or three milligrams to the ton, and it was with this waste material, obtained from the Colorado radium mines, that the experiments were made.

The radium-ore tailings were diluted with ordinary fertilizer and applied in the usual way in proportions of 25, 50, 100, and 200 lb. of radioactive substance to the acre. Five plots were made for each crop grown, one for each of the proportions of radioactive fertilizer, and one without fertilizer, as a control.

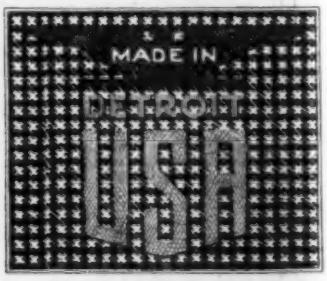
On the Ohio farm, pumpkins on soil treated with 100 lb. of radium fertilizer to the acre produced 135 per cent more by weight than on the untreated plot; late corn showed an increase of 105 per cent; oats, potatoes, cucumbers, cabbages, and tomatoes all showed increases of over 50 per cent, and other crops increased from 20 to 50 per cent. In the New Jersey garden, melons showed a gain of 80 per cent; radishes, 70 per cent; turnips, 129 per cent, and nearly all other vegetables gave greatly increased yields.

DESIGN FOR "MADE IN U. S. A." TRADE-MARK SELECTED

A design that is characterized by the judges as being "simple, strong and mechanically perfect" has been selected as the prize winner in the competition held by the Detroit Board of Commerce for obtaining the best "Made in U. S. A." trade-mark. The qualities specified in the specifications governing the competition were that the trade-mark should not only be suited to printing by ordinary processes, but that it should be suitable for reproduction by lithographic or color processes, for printing as a textile label in colors, and for reproduction by zinc or copper processes in one color, and that it should be adapted to use as a stencil, metal stamp, or die. Above all, it was to be thoroughly American in atmosphere, composition, and color scheme. The winning design not only possesses all these qualities but can be reproduced clearly in a width of as little as ¼ in. It is to become the property of the people of the United States, and it is expected that it will be adopted generally, the names of other cities being substituted.

Prize-Winning Design for National Label, Arranged for Colors

The Prize-Winning Design as Applied with a Stencil



How the Prize-Winning Design will be Woven into Fabrics

COMMENT AND REVIEW

JUST now a lot of well-meaning people, but most inexperienced for the task attempted, are essaying to evolve various plans for a peace pact which shall end the present war. Would-be reformers who would not think of going into a county court on a trivial case without a lawyer, profoundly offer their services in the settlement of differences which, when they are adjusted, as some day they must be, will require the master legal and diplomatic minds of the world.

Premature Peace Plans

It is commendable in all of us to talk and work and throw our influence in every practical, sensible way in furtherance of permanent and universal peace, but ill-timed and inadvised efforts are merely the getting in the way of the firemen by people who honestly want to see the conflagration extinguished but who have no experience in handling the apparatus.

As terrible as the present conflict is, and regardless of who is right and who wrong, it would be an even greater calamity to hasten a premature settlement, which would be only a temporary abatement of the fever, and not a radical cure and restoration to normal, permanent health.

WE are all inclined to look up to the physically big man, not only literally, but there is always a certain presumption in his favor that he must be correspondingly strong mentally. People make room for him; they attach more importance usually to what he says than to the same words uttered by an undersized man. We unconsciously picture in our minds the bayonet charge and storming of the trenches as the work of large men. The boy dreams of having a football physique and little sister worships her big brother.

The Medium-Sized Man

Other abilities being equal, the large man has a positive advantage over the small man. And yet many, if not the majority, of the great men of the world have been only of medium size, and not a few even undersized.

A certain large city in this country had for years made it a rule not to employ in its fire department any but large men. The result was a small army of athletes which never failed to cause a positive thrill whenever they went on parade. They distinctly represented the day of physical might.

For some years past the inventive mind has been busy, and very successfully, to produce apparatus which never tires, and calculated to transfer to a great extent the hard work from muscle to machine. The evidences of this evolution may be seen in even small towns everywhere, and now the fire engine drawn by volunteers and worked with hand brakes must be looked for in museums of strange mechanics of the past. In its place is the self-propelled gas-engined machine, carrying its own hose and capable of highly effective work with only two men; and ladder trucks by means of which one small man manipulating some short levers can in a few seconds raise great ladders to dizzy heights, or pour a deluge of water into tenth-story windows while standing in the street below. Hence it has come

about that the man small of stature but nimble of body and alert of mind is not only the peer but often the superior of the giant in build. There yet remains some work for the big athletes, but it is growing less each year, and the man whom nature has not endowed with great physical strength is coming into his own.

Doctors of Mechanics

So many laborious tasks have been taken over by machines, and so far-reaching has been the area of occupation, that it is only by pausing and taking a good look backward we can realize the progress made in this direction. A new and remarkable labor-saving invention is flashed into view, it is the talk and wonder of all for a few days and then retires to give place in the public mind to another which in turn must yield to yet another. Was there ever such an age, and where and when will we reach the limit of human initiative? On the farm, in the household, on land and sea, in shops, and in the air, it is one continuous story of the mastery of mind over matter. Immediately any service assumes large proportions and is difficult, or dangerous, or specially tiresome to perform, just so quickly the laws of mechanics and science, under the direction of brilliant minds and tireless energies, are concentrated on the problem. And like a piece of ice under the focus of a burning glass, no matter how cold the day, the problem melts and yields to a force it cannot resist.

What at first are expensive luxuries, under the pressure of demand soon become daily necessities, to be produced and sold at a price within the reach of thousands. The man who invents and he who by reason of study, experiment, and organization finds the way to manufacture a helpful article for a dollar which otherwise would cost ten to make—these Doctors of Mechanics—are doing a work for humanity in every way no less valuable than anything accomplished by our famous doctors of medicine.

It affords a positive relief to turn our thoughts from the weary depression of war to that helpful, hopeful progress which moves steadily, irresistibly onward and upward.

We Learn from Experience

A RESIDENT of Georgia, who is at the head of a very large mercantile business, said to me the other day: "Inability to sell our cotton has worked a great hardship to the South, but in the end it will prove a great benefit. For years our state agricultural colleges have urged the planting of more diversified crops, but their advice fell mostly on deaf ears. We felt secure in that old, comfortable, but now exploded boast, that we could build a stone wall around this country and live on just about the same. An almost total failure of the cotton crop even would not have worked the desired result, because any one staple could not fail every year. And now the flash light is turned on millions of bales of as fine cotton as ever grew, which must remain in storage until

Mr. Demand returns. And so our planters are figuring what they could have made with more corn and oats. It will take two or three, perhaps more, crops before our people learn how to approach the big corn production of the northern corn belt, but that the average production per acre can be doubled, by different planting and more cultivating, is already assured. The planting now determined on includes more food products than ever before, and a good share of this harvest will not be shipped as grain, but will be fed to pork and beef stock. The industrial departments of the railroads have done a splendid work in encouraging boys in the raising of corn, and where the average farmer was satisfied with 15 to 18 bushels per acre the boys have produced as high as 100 to 110 bushels from one acre. This of course was highly intensified production stimulated by the hope of winning some of the handsome prizes offered by the railroads, but nevertheless served as an actual demonstration of possibilities, and when reduced to the practical performance of large tracts shows returns which are highly profitable. The South will remain the cotton field of the world, but from now on it will grow millions of grains and other foods."

March 31, 1915. H. H. WINDSOR

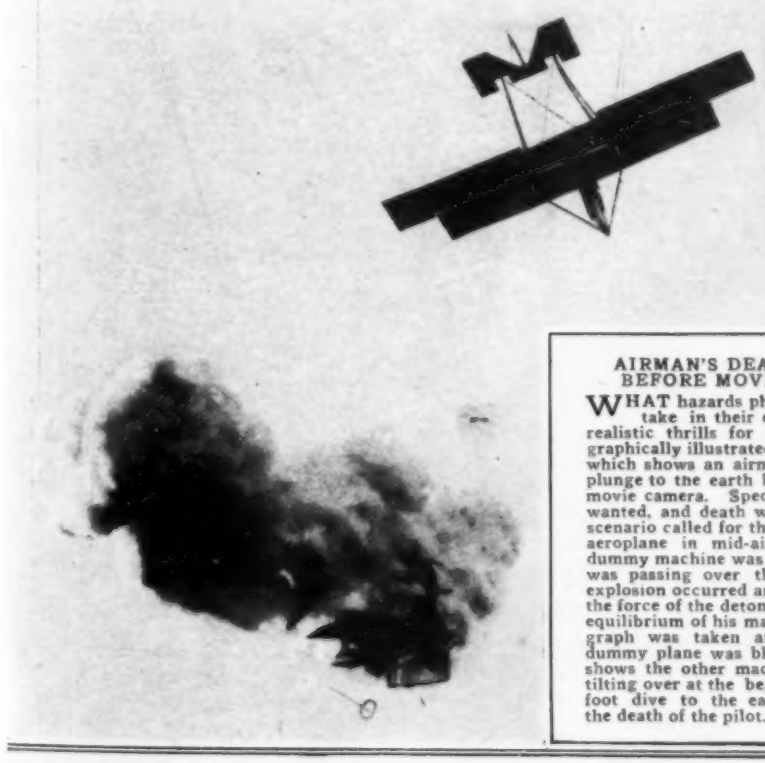


PHOTO BY WHIPPLE

AIRMAN'S DEATH PLUNGE BEFORE MOVIE CAMERA

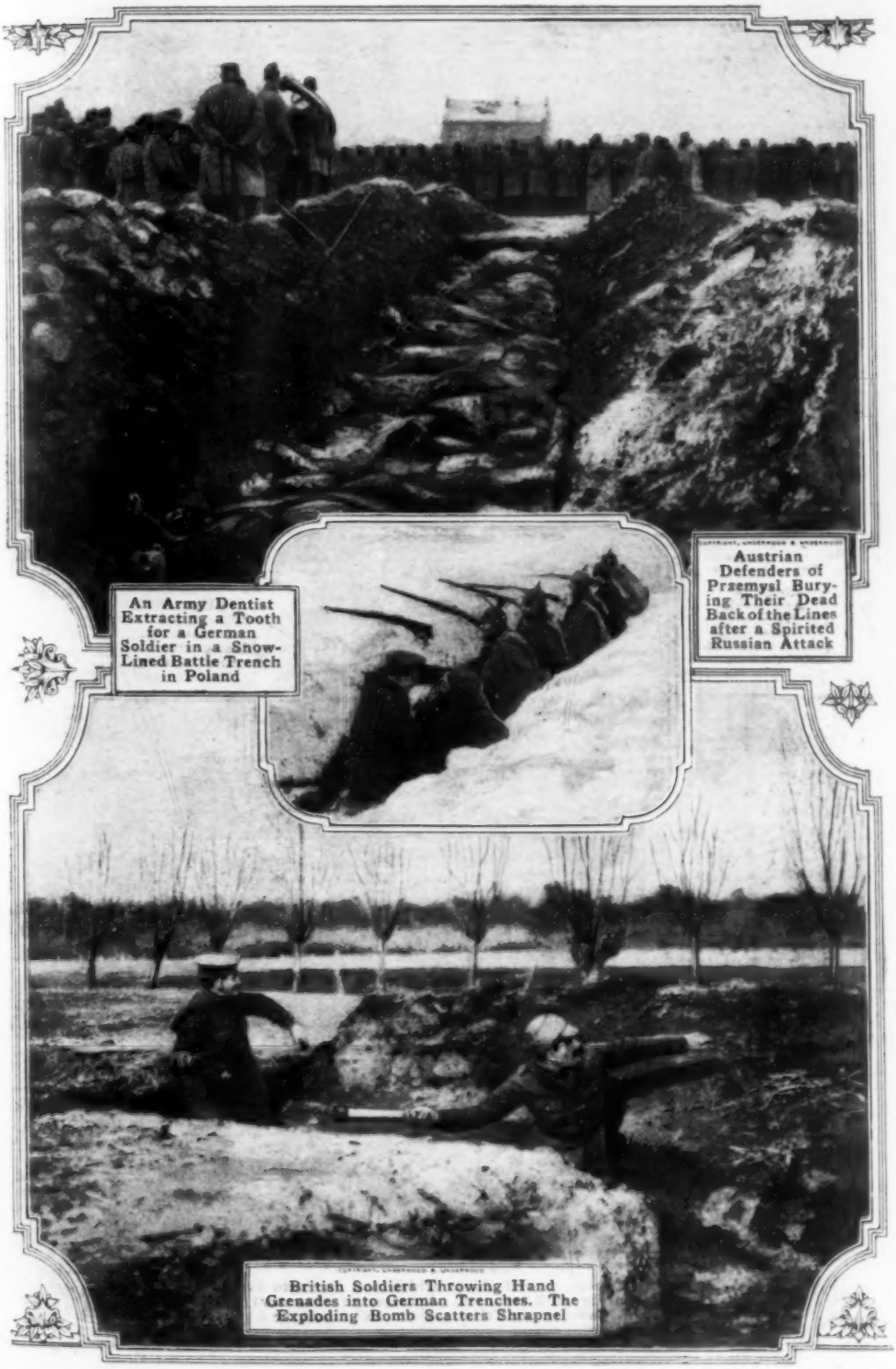
WHAT hazards photoplay performers take in their endeavor to furnish realistic thrills for the film drama is graphically illustrated in this photograph, which shows an airman making a fatal plunge to the earth before the lens of a movie camera. Spectacular realism was wanted, and death was the result. The scenario called for the destruction of an aeroplane in mid-air, and for this a dummy machine was used. The airman was passing over the craft when the explosion occurred and it is assumed that the force of the detonation destroyed the equilibrium of his machine. The photograph was taken an instant after the dummy plane was blown to pieces and shows the other machine in the act of tilting over at the beginning of its 300-foot dive to the earth which ended in the death of the pilot.

ALLIED FLEET AT ENTRANCE OF DARDANELLES

COPYRIGHT, UNDERWOOD & UNDERWOOD

This Remarkable Photograph Shows Part of the Allied Fleet in Battle Formation at the Entrance of the Dardanelles Shortly before the Bombardment of the Outer Defenses. It was Taken from Aboard the French Battleship "Bouvet," Which was Subsequently Sunk by a Mine during the Engagement before Erenkoi

STRIKING SCENES IN CONTINENTAL TRENCHES

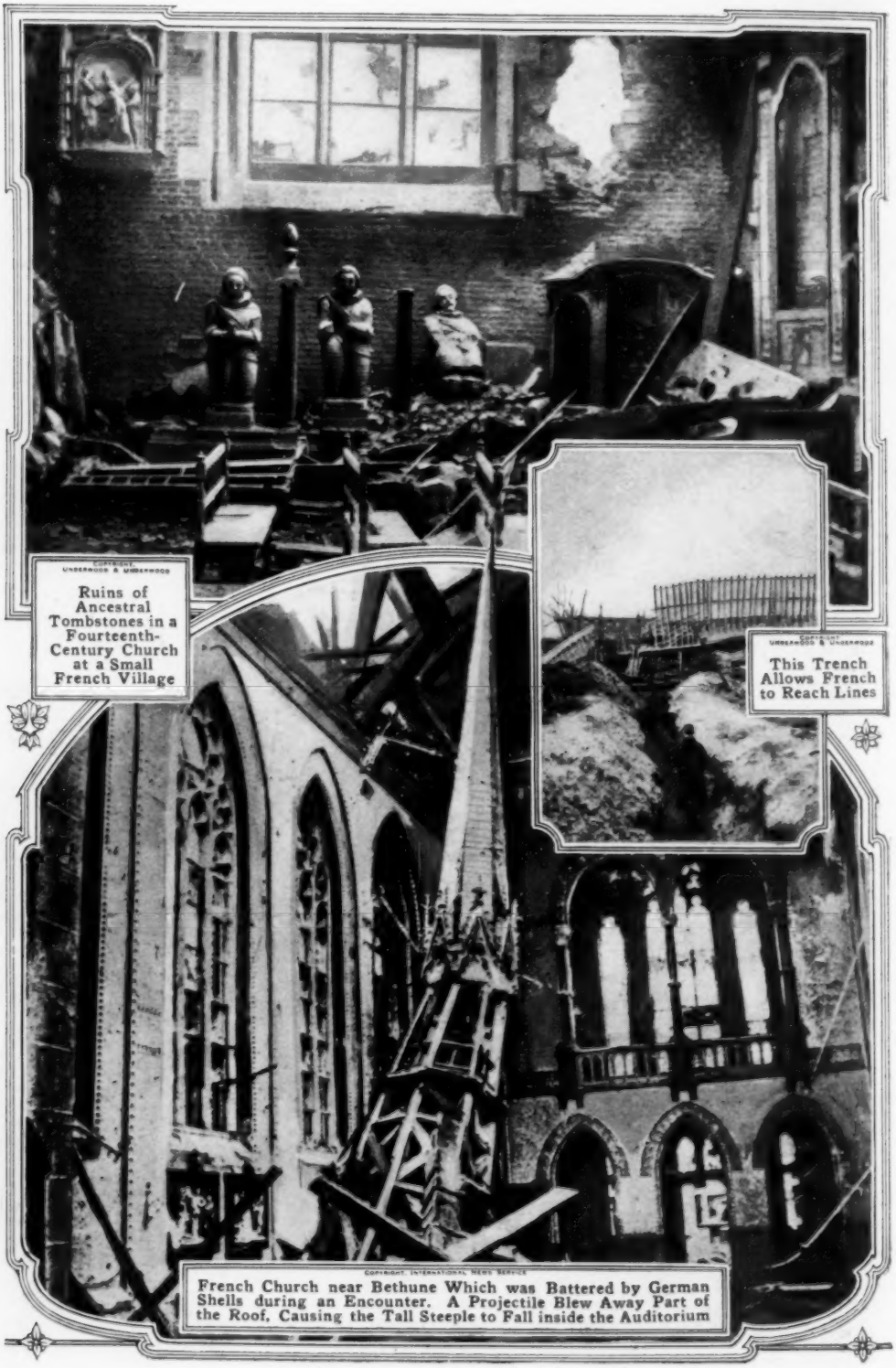


Austrian Defenders of Przemysl Burying Their Dead Back of the Lines after a Spirited Russian Attack

An Army Dentist Extracting a Tooth for a German Soldier in a Snow-Lined Battle Trench in Poland

British Soldiers Throwing Hand Grenades into German Trenches. The Exploding Bomb Scatters Shrapnel

FRENCH CHURCHES DESTROYED BY GERMAN GUNS



COPYRIGHT UNDERWOOD & UNDERWOOD

Ruins of Ancestral Tombstones in a Fourteenth-Century Church at a Small French Village

COPYRIGHT UNDERWOOD & UNDERWOOD

This Trench Allows French to Reach Lines

COPYRIGHT, INTERNATIONAL NEWS SERVICE

French Church near Bethune Which was Battered by German Shells during an Encounter. A Projectile Blew Away Part of the Roof, Causing the Tall Steeple to Fall inside the Auditorium

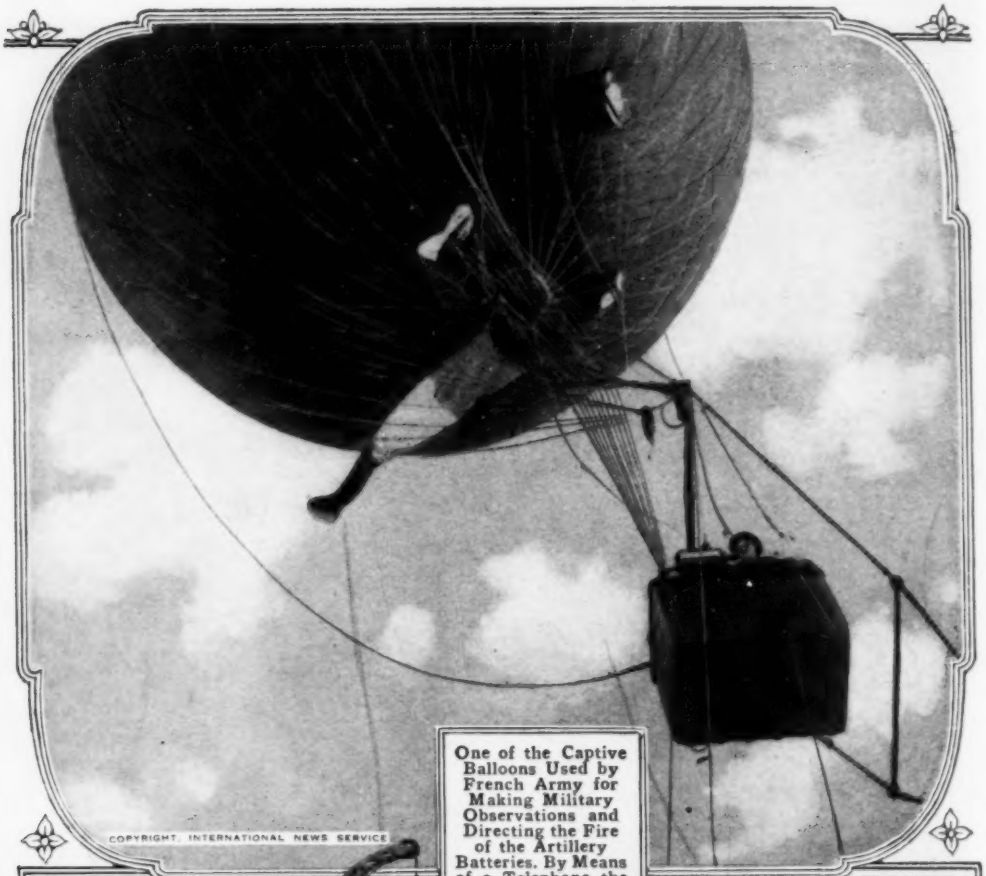
PARTS PLAYED IN THE WAR BY BOYS AND DOGS

German Children Bringing to School Copper Utensils Requisitioned from Their Homes by the Government for War Purposes

Dog Decorated with Iron Cross for Saving Germans from Ambuscade

Ten and Twelve-Year-Old Boys in Germany are being Thoroughly Trained in Military Maneuvers and Taught Marksmanship, in Order That They may be Ready to Serve Their Country When Old Enough

MAKING OBSERVATIONS FROM A CAPTIVE BALLOON



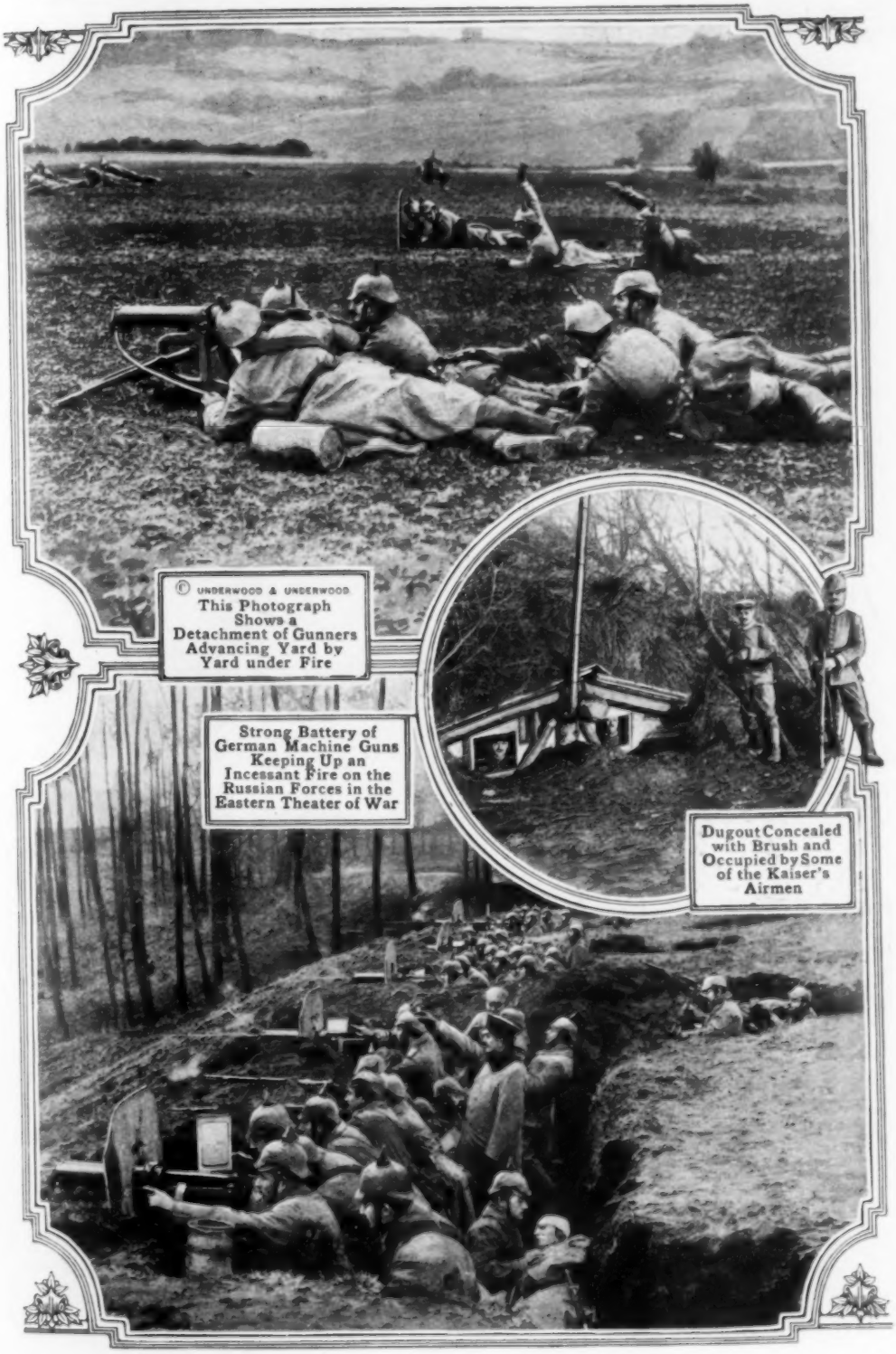
COPYRIGHT, INTERNATIONAL NEWS SERVICE

One of the Captive Balloons Used by French Army for Making Military Observations and Directing the Fire of the Artillery Batteries. By Means of a Telephone the Observer Is Able to Keep the Gunners Informed as to Where Their Shells are Striking

The Austrian Aeronautic Base at Przemysl before the Triumph of the Russian Forces: The Machine Shown in the Foreground was Used to Generate Gas for Captive Balloons. The Field Hangars are to be Seen in the Distance

COPYRIGHT, UNDERWOOD & UNDERWOOD

MACHINE-GUN BATTERIES ON THE FIRING LINE



© UNDERWOOD & UNDERWOOD
This Photograph Shows a Detachment of Gunners Advancing Yard by Yard under Fire

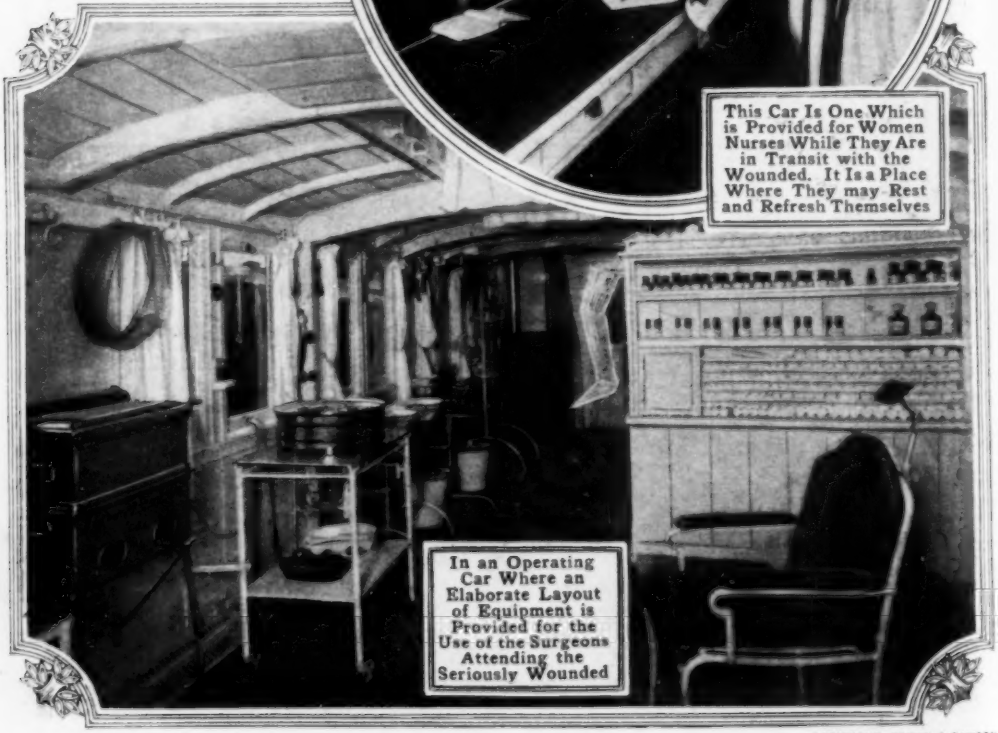
Strong Battery of German Machine Guns Keeping Up an Incessant Fire on the Russian Forces in the Eastern Theater of War

Dugout Concealed with Brush and Occupied by Some of the Kaiser's Airmen

GERMAN AMBULANCE TRAIN READY TO TRANSPORT

German Ambulance Train on Way to Front to Collect Wounded Soldiers from the Field Hospitals and Rush Them to Bases Where They may be Given Proper Attention

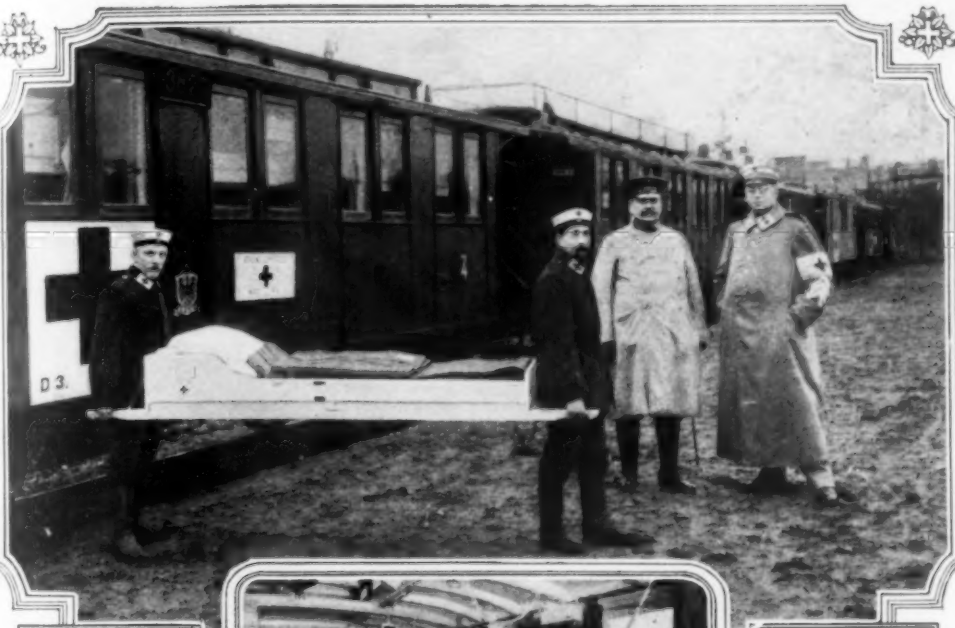
This Car Is One Which is Provided for Women Nurses While They Are in Transit with the Wounded. It Is a Place Where They may Rest and Refresh Themselves



In an Operating Car Where an Elaborate Layout of Equipment is Provided for the Use of the Surgeons Attending the Seriously Wounded

COPYRIGHT BROWN & DAWSON

ARMY OF WOUNDED SOLDIERS TO HOSPITAL BASES

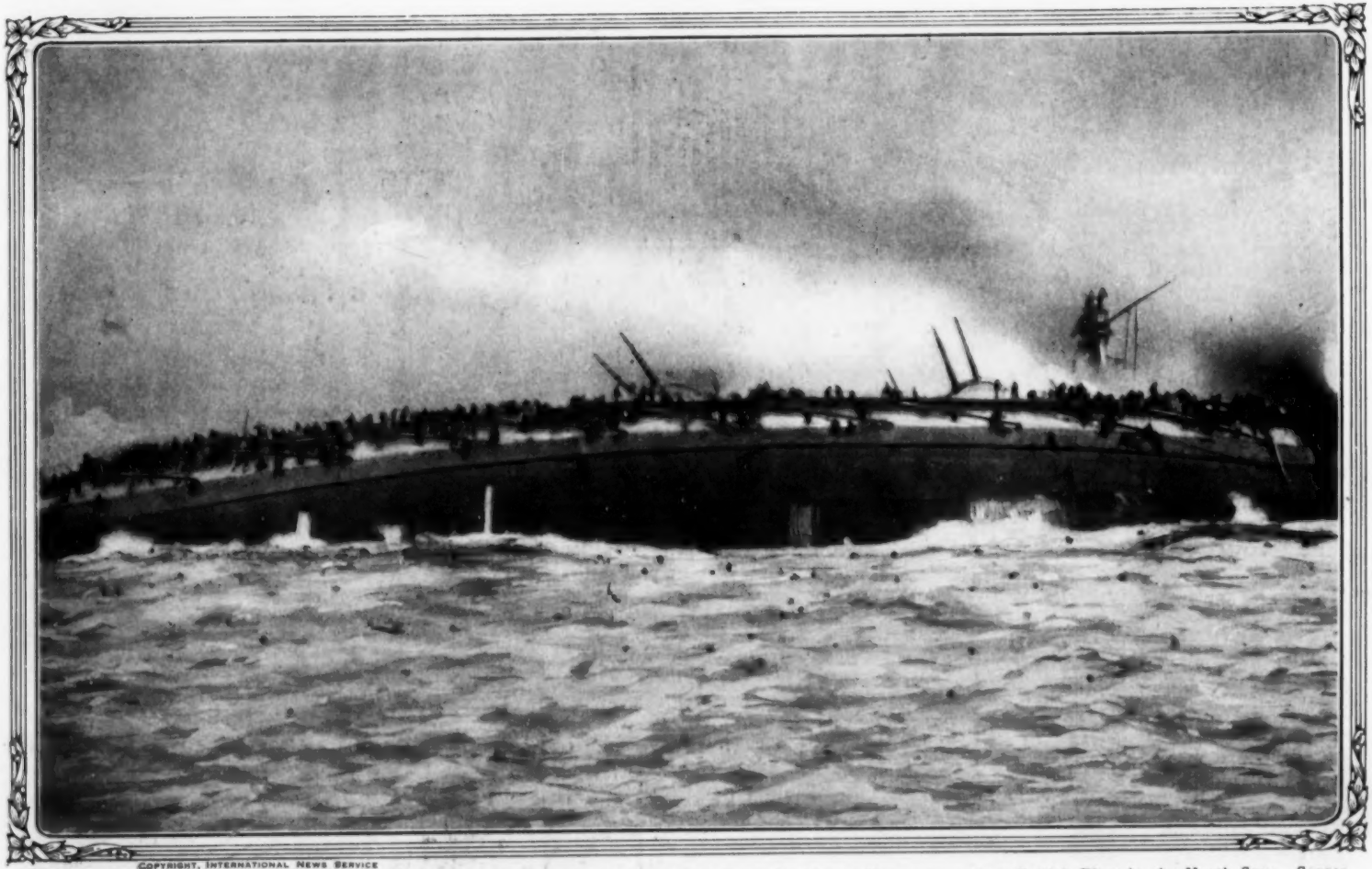


There Is Little Delay in Handling the Men When the Train Arrives at the Hospital. They are Removed on Stretchers as Quickly as Possible

At the Left and Below are Shown the Interiors of Ambulance Cars Where the Wounded are Cared for en Route between Field and Hospital

COPYRIGHT, BROWN & DAWSON

AWAITING DEATH ON THE SINKING "BLUECHER"



COPYRIGHT, INTERNATIONAL NEWS SERVICE

The Last Minutes of the German Cruiser "Bluecher," a Mass of Flames after being Torpedoed in an Encounter with a British Fleet in the North Sea: Scores of Its Sailors, Still Alive, but Waiting for Death, are Clinging to the Slippery Hull as the Vessel is Gradually Turning Over and Sinking from Sight

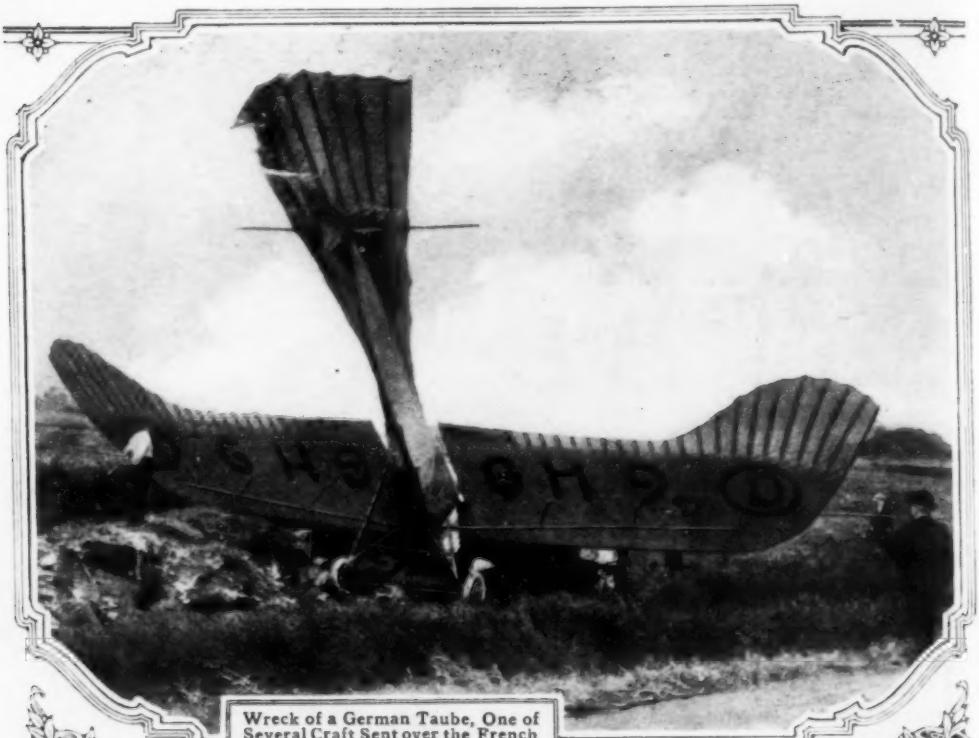
NEW ARTILLERY PIECES NOW IN USE IN EUROPE

These Two Heavy Schneider Guns, Neither of Which has Seen Service, are being Rushed along the Yser to Strengthen One of the French Positions

Muzzle-Loading German Trench Mortar Captured by the Belgians: It is Used Very Effectively at Close Range to Blow Up Breastworks

One of France's New 14-Inch Guns Which are Reputed to be More Mobile and Easily Assembled Than the Big Krupp Pieces

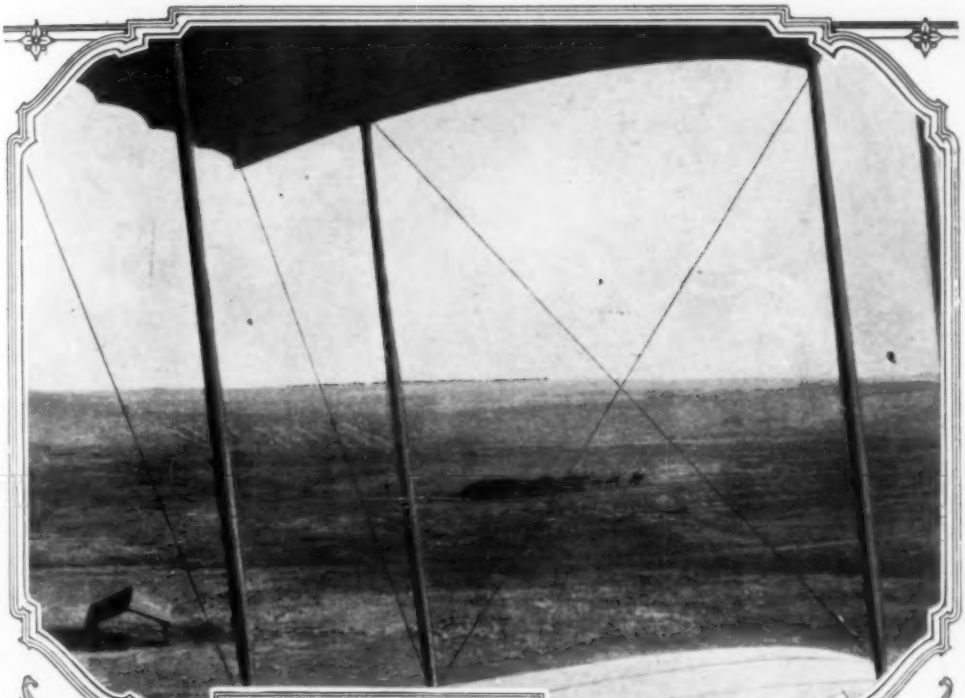
THE WAR AEROPLANE AND ONE OF ITS ENEMIES



Wreck of a German Taube, One of Several Craft Sent over the French Lines on a Scouting Expedition. The Airman was Struck by a Bullet from a Machine Gun and the Aeroplane Crashed to Earth

Battery of French Armored Motor Cars, One of the Several Enemies of the War Aeroplane, Halted for Consultation of Road and Contour Maps of the District Ahead

SEEN ON DIFFERENT EUROPEAN BATTLE FIELDS

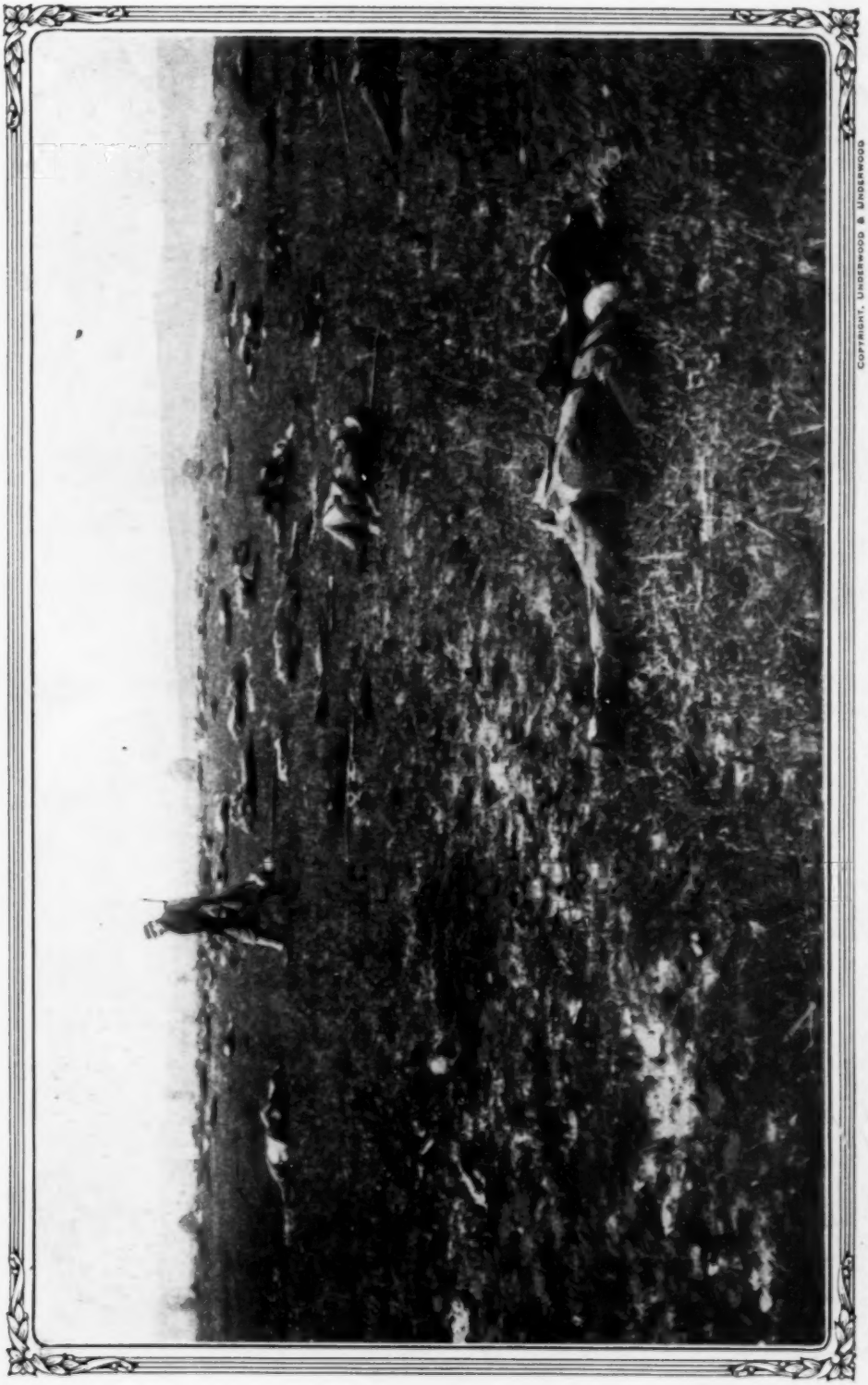


This Shows What an Aerial Scout Sees When He Flies above an Enemy's Lines for Reconnaissance Purposes. Approaching Below Is a Cavalry Squadron in Advance of Heavier Forces in the Background

An Approaching German Taube was Sighted by the Crew of This French Motor Car. A Rain of Bullets was Directed at the Speck in the Sky, but the Flier Escaped

PHOTOS COPYRIGHT UNDERWOOD & UNDERWOOD

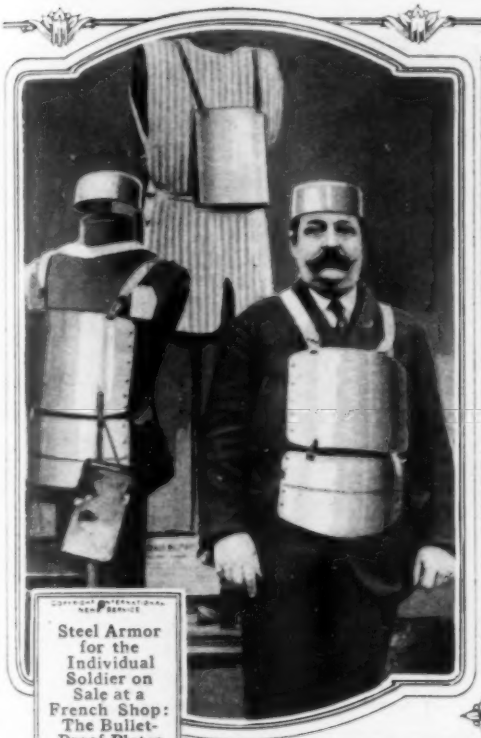
THE "GLORY OF WAR" AS THE SOLDIER SEES IT



COPYRIGHT, UNDERWOOD & UNDERWOOD

This Photograph, One of the Most Remarkable Ever Taken on a Battle Field, was Made Following a Charge by German Forces across Open Ground in the Face of French Machine Guns. Dead Litter the Field Farther Than the Eye can Reach. The Scene Shows the "Glory of War" as the Man at the Front Sees It

UNUSUAL THINGS BEARING ON EUROPE'S WAR



Steel Armor for the Individual Soldier on Sale at a French Shop: The Bullet-Proof Plates are Strapped to the Body

This Shows a Clip of Cartridges, Carried by a British Soldier in His Bandolier, Which was Pierced by a Bullet during an Engagement

An Army Maneuver Ground near Berlin being Plowed Preparatory to Planting Spring Vegetables for the Poor Classes Who Are in Need

CURIOSITIES OF THE WAR SEEN BY THE CAMERA

This Shows One of the Shells and Its Propulsion Charge of Cordite, Such as are Used in the Big Guns on British Dreadnaughts

Many Residents of Scarborough and of Other Towns on the East Coast of England have Constructed Private Bombproofs

Remarkable Photograph Showing the Dynamiting of a Bridge by Retreating German Forces in an Attempt to Cut Off Their Pursuers

SCOUTS AND SNIPERS AT WORK AT THE FRONT

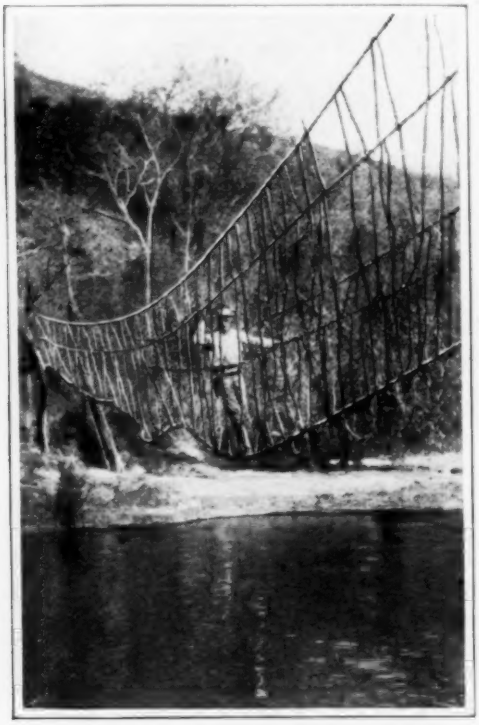
German Scouts in the Enemy's Territory Crossing Small Stream near the Aisne by Climbing along the Trunk of an Overhanging Tree

French Marksman behind Iron Breastwork Waiting Opportunity to Show His Skill

French Scouts in Advance of a Reconnoitering Party Discovered Some German Trenches. Followed by Their Regiment They are Charging the Position

ROPE BRIDGE OVER RIVER IN ECUADOR MOUNTAINS

Across one of the several rivers in the mountainous province of El Oro, in the western part of Ecuador, is a



This Hammock Bridge Forms the Only Means of Crossing above the Stream at This Point

hammock bridge constructed entirely of rope. At the point where this swinging structure is stretched between the bluffs on either side of the stream, it forms the only means of crossing above the water. To use it, a person is forced to hold to the guy lines on either side and walk dexterously along a single rope which forms the bottom chord of the V-shaped network. For the uninitiated this requires no little exercise of care, but the mountain people who are accustomed to it climb along the line with great agility and ease.

¶The development of the "jitney bus" has stimulated the market for second-hand automobiles.

NEW BRITISH HOWITZER IS CALLED "COVENTRY GUN"

Howitzers that compare with the famous 42-centimeter guns of the Germans, which were the big surprise of the beginning of the present war, have been built for the British army and some of them have already been taken to the continental war zone.

The new weapon, known in England as the "Coventry gun" from the place of its manufacture, has a bore of 15 in. as against the 16.5 in. of the big German war tool. It is claimed, however, that it will fire a heavier projectile and has a mile greater range. Its chief advantage, however, lies in its portability. The "Busy Bertha," as the German gun has been nicknamed as a compliment to Frau Bertha Krupp, the owner of the famous gun works, requires an extensive concrete foundation, and except where such emplacements have been prepared in advance, it takes two or three days to get the monster ready to be fired. The Coventry gun, on the other hand, can be completely assembled in five hours and can be placed wherever the ground is firm enough to support a traction engine.

The standard shell for the Coventry gun weighs a trifle over 1,800 lb. Its head is solid, of armor-piercing type like a naval shell. Back of this is the chamber for the lyddite, or other high explosive, constituting the bursting charge, and the rear end of the shell is another solid mass, to give momentum. The whole is so designed that the shell has great penetrating power and will not explode instantly upon impact but an appreciable instant afterward, so that if the shell should penetrate the wall of a fortress the explosion would take place inside.

The expectation of the British authorities is that these new Coventry guns will be used against the German fortified towns in Alsace and Lorraine. Twelve of them have been built. Should they all go into action at once the combined weight of metal thrown in a single broadside would be more than ten tons.

WHERE SHIPS ARE HIGH AND DRY TWICE A DAY

IN the Bay of Fundy, Canada, the daily rise and fall of the tide is as great as 60 feet in some parts of the narrow inlet that penetrates 170 miles inland from the sea. The harbor of St. John, N. B., at low tide, is shown in this photograph, the water rising every 13 hours to within a few feet of the wharf stringpiece. The hard sandy bottom is a good motor highway at low tide.

USING MOTOR LAUNDRIES IN EUROPEAN WAR

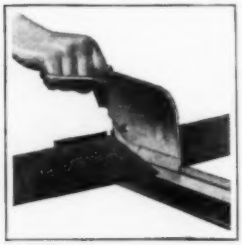
Motor-drawn laundries operated in connection with field hospitals are the latest feature in the European war, the equipment for each laundry being carried on a powerful motor truck and three trailers. The motor truck carries a steam mangle which is removed when the laundry is to be operated. The first trailer carries a complete steam plant with boiler, turbine, drying cabinet, and disinfecting tank, while the second carries the washing machine with centrifugal drying drums and other accessories. Tools and such supplies as soap, soda, coal, and gasoline are carried on the last trailer. When the laundry is in operation the trailers are arranged in the shape of a horseshoe and are usually covered by a tent, while the motor truck, with the steam mangle removed, is used for carrying laundry to and from the hospital. The capacity of the outfit is about 3,000 lb. of assorted laundry per day.

MINIATURE FLYING MACHINE ORNAMENT FOR HAIR

One of the odd styles that have been developed in Europe since the outbreak of the war is a new fashion in headdress which is worn in England with clothing of a military cut. The hair is built high on the head with puffs and surmounted by a miniature aeroplane, which is supported at the end of a slender wire that fastens in the coiffure. Frequently a small flag is also used as an ornament in addition to the flying machine.

BELT-CUTTING INSTRUMENT TIME-SAVING DEVICE

Designed for the purpose of cutting various kinds of belting and squaring the ends without requiring the use of a try-square, an instrument has been devised which may be used on any size belt not greater than 14 in. in width nor more than 1 in. thick. The device consists of a heavy drawknife, the top part of which is fitted with a handle while the bottom part extends through a groove into an inclosed case where it is mounted on roller bearings. The case is made of steel in the form of a grooved bar, at one end of which, on either side of the groove, are two upright pieces which protrude above the surface sufficiently far to hold a belt squarely when it is being cut. The groove serves as a guide for the knife and the top of the bar as a cutting table.



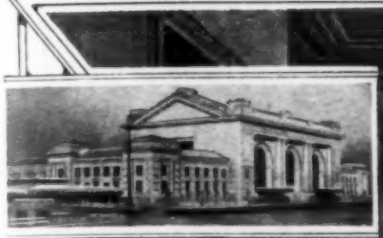
WIRELESS BETWEEN UNITED STATES AND NORWAY

Through the operation of wireless stations now being erected in Massachusetts and on the coast of Norway, commercial wireless communication between the United States and Norway is soon to be established. The two American stations, one located on Cape Cod and the other at Marion, on the west shore of Buzzard's Bay, are now practically completed. The total cost of these two stations is estimated at about $1,500,000. It is now reported that the stations are to be put in operation as soon as completed to meet the situation arising from the war.

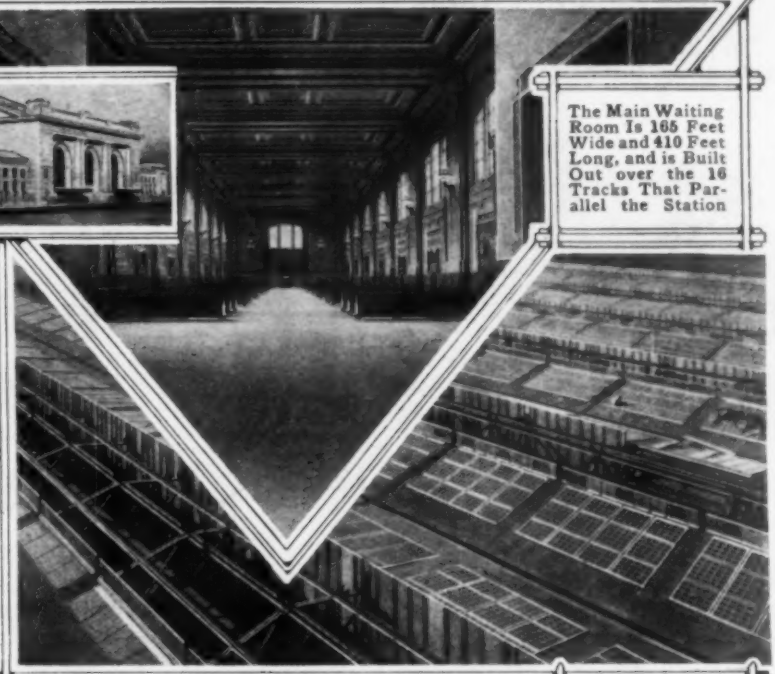
MODERN STATION PLANNED TO ELIMINATE CONFUSION

Facilities for handling complicated passenger traffic on a large scale, without confusion between the different routes or between incoming and outgoing traffic, probably constitute the biggest feature about the new union passenger station at Kansas City, although the station itself is one of the largest and most costly in the world. An average of 260 trains daily, carrying a total of from 25,000 to 28,000 passengers, use this station, and every day there are about 530 tons of mail and 7,000 pieces of baggage handled. The value of the tickets sold annually is something like $5,000,000.

The most impressive feature about the station is the grand lobby, a spacious room entirely free from columns, 230 ft. long, 100 ft. wide, and 90 ft. high. The ticket office, built of solid bronze and having 24 windows, occupies the space between the two main entrances and projects 48 ft. into this room. Around the walls are grouped dining and lunch rooms, and all other facilities needed by the traveler. The grand lobby is the only place in the station where incoming and outgoing passengers meet. Outgoing passengers go from this room into the main waiting room, which is a structure 165 ft. wide and 410 ft. long, built out over the 16 tracks that parallel the station. From this room individual stairways lead down to each of the track platforms. Incoming passengers are lifted by elevators to one of the two "midways," which are simply corridors leading to the grand lobby. The midways are located one on each side of the waiting room, are parallel with it and at approximately the same level. The baggage room is the largest in the United States, containing over 74,000 sq. ft. of floor space. All baggage, mail, and express is transferred to and from trains through tunnels passing under the tracks. The station cost about $5,000,000, while the terminal of which it is a part cost upward of $50,000,000.

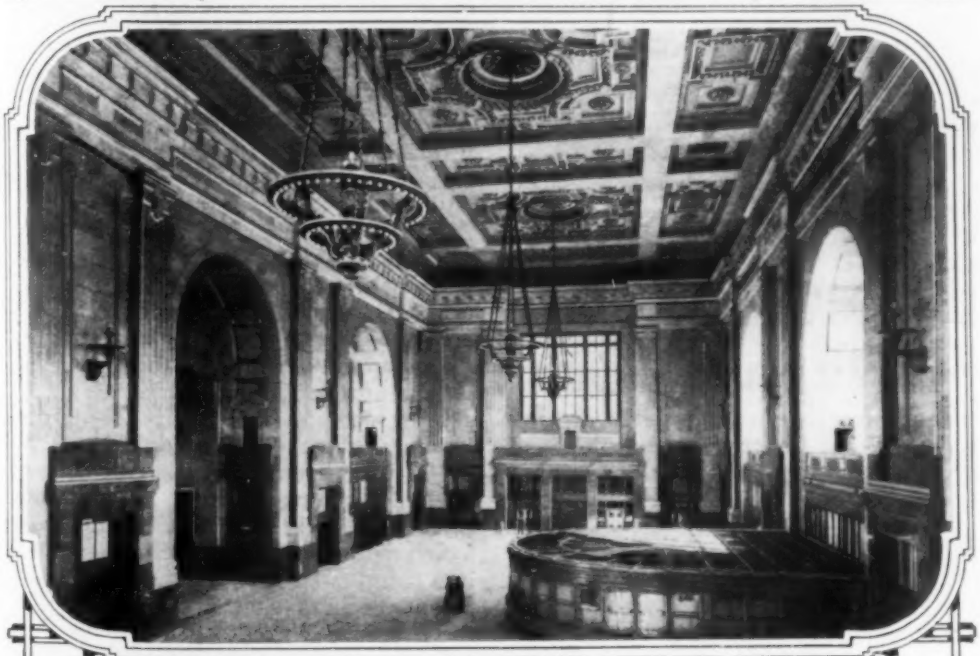


New Union Passenger Station at Kansas City, Mo., Built at a Cost of $5,000,000 and so Designed as to Eliminate Confusion in the Heavy and Complicated Traffic That Passes through It



The Main Waiting Room Is 165 Feet Wide and 410 Feet Long, and is Built Out over the 16 Tracks That Parallel the Station

A View of the Train Sheds: Each Track is Reached by Outgoing Passengers by a Stairway Connecting with the Main Waiting Room, While Incoming Passengers are Lifted by Elevators to "Midway"



Looking East in the Grand Lobby: At the Right Is the Ticket Office, Built of Solid Bronze, and at the Left Is the Arched Entrance to the Main Waiting Room

FREIGHT CARS ARE BUCKLED IN HEAD-ON COLLISION

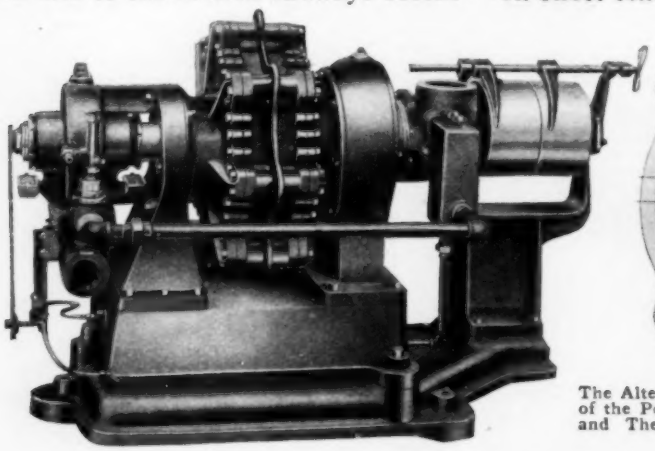
While running at considerable speed on one of the eastern railways recently, a long freight crashed head-on into a heavy work train. The impact of the collision was so great that two of the box cars were buckled by the solid resistance ahead and the momentum behind them. Such behavior is not

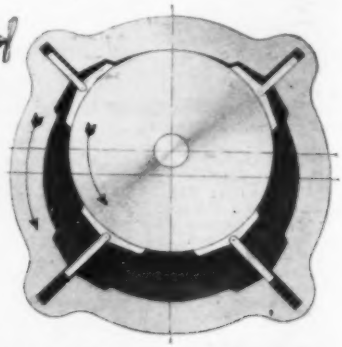
Two Cars in the Middle of a Long Freight Train Buckled When a Head-On Collision Occurred

unusual for two engines when coming together, but for cars in the middle of a train is not so common.

ROTARY AIR COMPRESSOR OF A NEW TYPE

A simple and ingenious rotary air compressor that has just been developed, compresses the air by utilizing the alternate expansion and contraction of pockets formed between a rotating casing and a cylinder that rotates within it, both the casing and the cylinder being made to rotate in the same direction and at the same speed but on offset centers. Owing to the eccentric mounting, the casing and cylinder are close together at the top, while the space between them spreads down each side and has its greatest width at the bottom. This space is divided into four pockets by vanes that are hinged to the cylinder and project into slots in the wall of the casing. The shaft of the cylinder is hollow and is mounted within the stationary bearing of the casing. By means of pipes projecting into each pocket air is drawn in through one end of the hollow shaft and discharged through the other end. As a given pocket rotates away from the top it widens at a regular rate, sucking in air until it reaches the bottom. During this process only the inlet pipe is open. When the pocket starts up the other side the inlet pipe closes automatically, and the air is compressed as the space contracts. When the pocket reaches the top, the outlet pipe opens, and the compressed air is discharged into a container through the hollow shaft. Leakage from one pocket to another is prevented in a simple manner. In the case of adjacent pockets that are compressing, the pressure is greatest in the one that is in the lead, and the excess pressure thrusts the vane against the side of the slot, forming an air-tight seal.

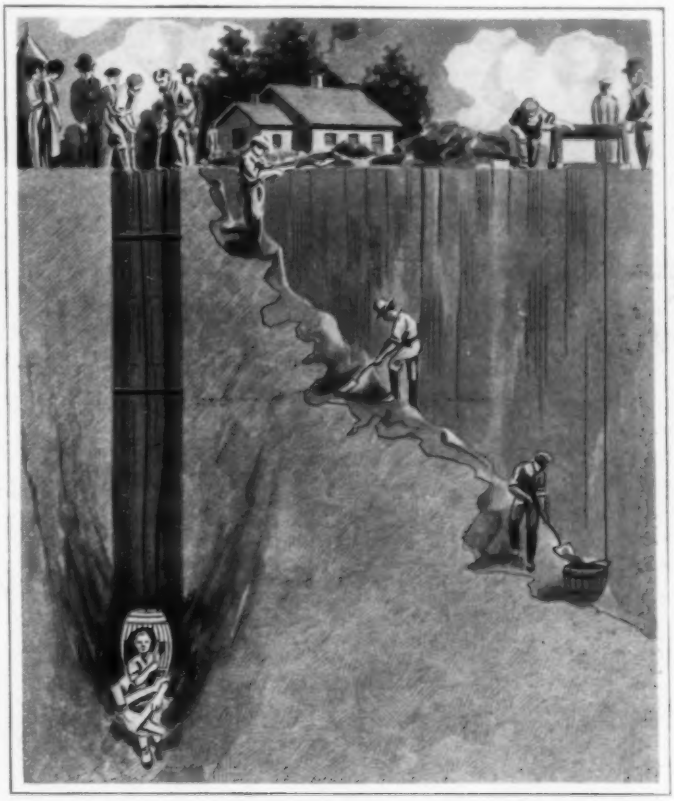




The Alternate Expansion and Contraction of the Pockets Causes Air to be Drawn In and Then Compressed in Each Pocket

NEW SERVICE TO BROADEN PATROL OF COASTS

With the creation of the United States Coast Guard a system of coast patrol is to be put into effect which will practically constitute a beginning in the plan of girdling our coasts with a series of wireless stations operated in conjunction with a submarine patrol, as suggested in the January, 1915, number of this magazine. The life-saving service, which has been absorbed by the coast guard, maintains a beach patrol that keeps a lookout for ships in distress and has a system of telephone lines connecting with the life-saving stations. Under the new arrangement this system will be perfected and the life-saving stations will be connected, either by wireless or by telephone, with naval stations along and near the coast. This system is designed to be used in connection with life-saving and revenue-cutter services, but its value in time of war is evident, as the coast patrol would then have a means of giving to the Navy Department immediate notice of the approach of hostile vessels.



With a Barrel over His Head and Getting Both Air and Nourishment through Tubes, a Man Lived, Buried in Quicksand, Until Rescuers Reached Him after More Than 24 Hours

---

MAN BURIED IN QUICKSAND KEPT ALIVE UNTIL SAVED

In the course of digging a well shaft on his property near Ware, Mass., a farmer encountered quicksand at a depth of approximately 25 ft. beneath the surface of the ground, and sank in it until his head alone was visible when his predicament was finally discovered. Every possible agency was called upon to assist in the rescue work, the fire department included, but despite this he was buried for more than 24 hours before he could be taken from his precarious position. The reason for this was that in digging the shaft he had stood on a platform made of planking and when the quicksand sank beneath his weight his feet were caught by the boards, making it necessary to uncover his entire body before he could be saved. This work, at first sight an easy task, was rendered difficult by the continual caving in of the shaft when the rescuers, clinging to a ladder, attempted to dig the man out. This plan had to be abandoned entirely, and to keep the victim alive it was necessary to make an improvised helmet out of

a barrel and lower it over his head. Reaching from this were two rubber tubes, one of which was used to supply him with air and the other to provide him with nourishment. From a point about 50 ft. away from the well a ditch 30 ft. deep, which was timbered as the work went on, was dug to the shaft and the man finally reached.

BIRTHDAY-CAKE CANDLES HELD ON BOARD

Birthday-cake boards arranged to accommodate any number of candles up to 96, are being made of hard wood

Board for Birthday Cake Holds Large Number of Candles

finished in its natural color. These boards are circular in shape, and around the outer margin is provided a series of holes in which the candles are held, while the cake itself is placed in the middle of the tray. When the board is used the practice of placing candles on the cake is not followed.

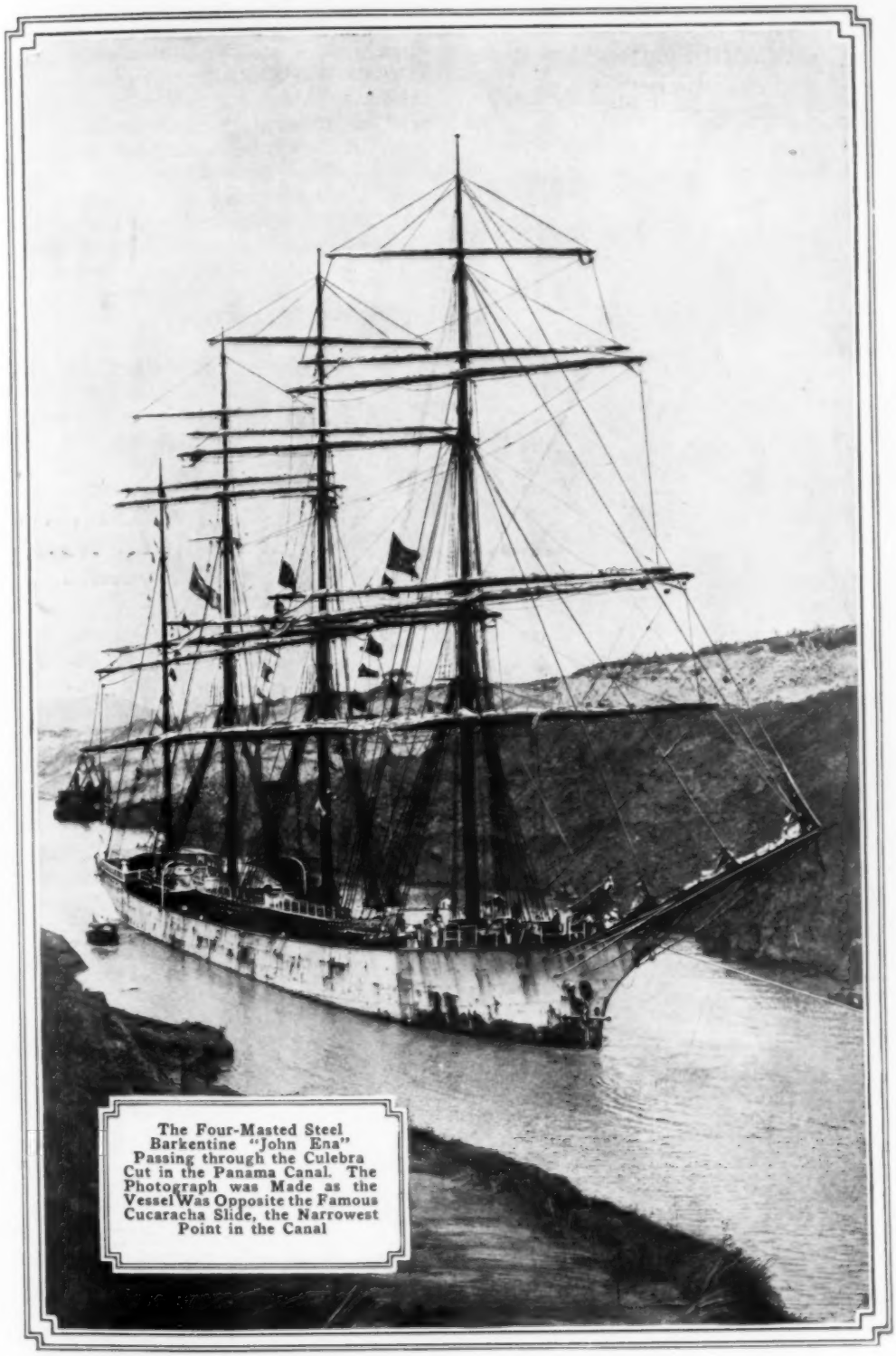
SAILING CRAFT ARE USING PANAMA CANAL

Contrary to the general belief of navigators prior to the opening of the Panama Canal, sailing ships are using the new passage as well as steamers. The expense of tolls and towing, it was assumed, would make it less desirable for such craft, usually carrying cheap bulk freight, to cross the isthmus than to make the longer voyage around the Horn. Experience thus far, however, indicates the contrary.

The largest sailing vessel that has so far used the canal is the four-masted steel barkentine "John Ena," a photograph of which, taken while it was passing through the Culebra Cut at the narrowest point of the canal, is shown on the opposite page. The "John Ena" is 313 ft. long, 48 ft. beam, and 25 ft. deep, and measures 2,609 net tons by canal measurements. The cost of passing through the canal was $3,130.80 for toll and $302.15 for tug service. On the vessel's cargo of 4,400 tons of petroleum and wax this makes a charge of 78 cents a ton. The tolls on laden steam vessels have averaged around 75 cents a ton of cargo. These do not require tugs through the canal.

According to the estimates of the canal authorities a sailing vessel should reach the isthmus from New York in about 20 days, or from the English Channel in about 30 days. Besides the "John Ena," four other sailing craft had used the canal up to the middle of February. The largest vessel of any kind to pass through the canal in that time was the passenger steamship "Kroonland" of the Red Star Line, flying the American flag, which went through on February 2. The "Kroonland" is 560 ft. long, 60 ft. beam, and drew over 29 ft. of water when traversing the canal. The canal-toll charge for the passage was $9,879.60.

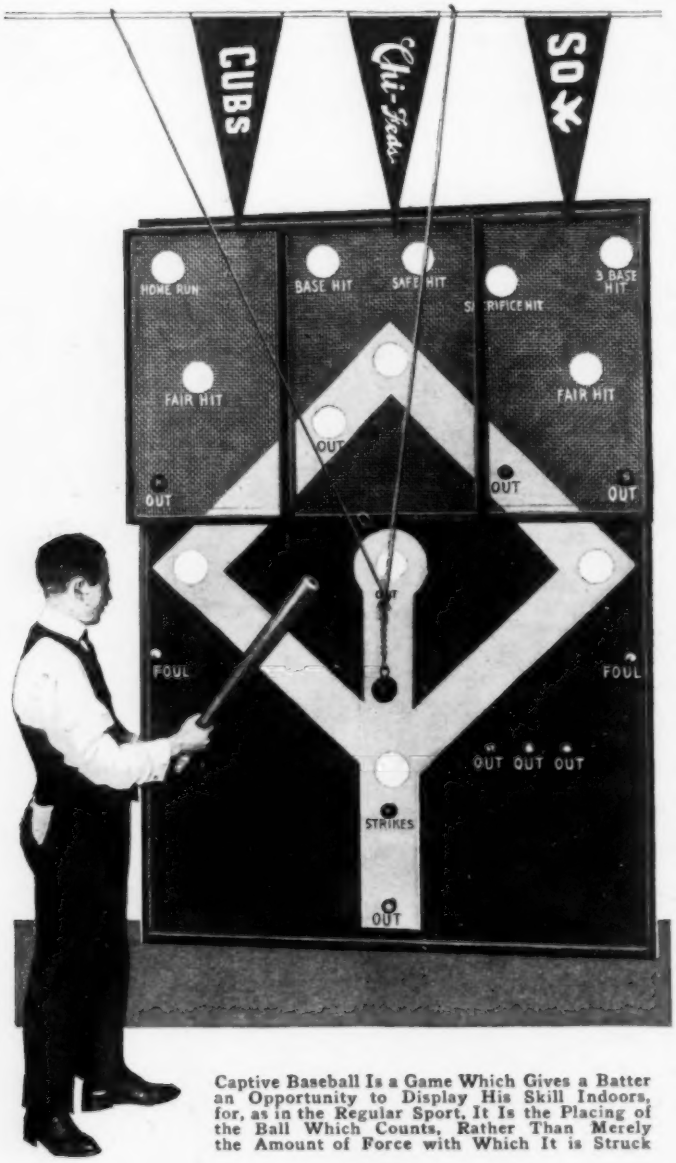
¶A Pan-American gold coin of the value of $5, for use as standard currency in all the countries of North and South America, is proposed by a New York bank.



The Four-Masted Steel Barkentine "John Ena" Passing through the Culebra Cut in the Panama Canal. The Photograph was Made as the Vessel Was Opposite the Famous Cucaracha Slide, the Narrowest Point in the Canal

CAPTIVE-BASEBALL GAME PLAYED INDOORS

Captive baseball is a newly devised indoor sport. It is played with an apparatus which is partly electrical, but in principle very like some of the devices used in amusement parks. The chief difference in this game is that the pitching machine is absent. The ball is suspended at the end of a cord hung in front of the batter, who stands before a backstop on which a diamond and the various positions taken by the different players are marked plainly. Placement of the ball is the point of the game. A pull on the line holding the ball starts it swinging, the batter then knocking it against the backstop, or registering board, and his score being shown by the ignition of one of a number of incandescent lamps.



Captive Baseball Is a Game Which Gives a Batter an Opportunity to Display His Skill Indoors, for, as in the Regular Sport, It Is the Placing of the Ball Which Counts, Rather Than Merely the Amount of Force with Which It is Struck

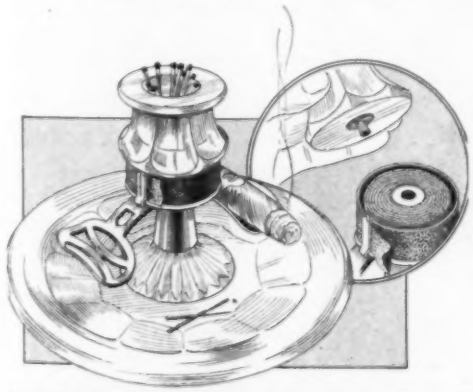
SILENT AREA OF FOGHORN NOW EXPLAINED

Fog signals, under some conditions, may be audible for a distance of a mile or more from the signal station and again at a distance of three or more miles, while between these areas lies a space within which the signal cannot be heard. Many wrecks that have occurred while near-by fog signals were in full blast are attributed to the fact that the wrecked vessel was in this belt of silence, steaming toward the rocks, and its officers could not hear the foghorn until too late to alter the ship's course or check its momentum. Observations conducted by British authorities, in which the temperatures of fog banks at different heights above sea level were recorded by instruments sent up on kites, indicate that the existence of the silent

area is due to temperature variations. The atmospheric temperature was found to rise with the altitude in every fog examined. In some instances, however, a layer of air in which the temperature rose more slowly overlay the fog bank. Such an air layer would refract the rising sound waves more slowly, and these refracted waves would return toward sea level at a much wider angle than those refracted through the lower mass of fog. In such a case, the foghorn would be audible close by and at a distance, but not in the intermediate region.

ASH TRAY WITH CONTINUOUS MATCH-STRIKING SURFACE

A new device for the convenience of smokers is designed to do away with the annoyance of trying to get a safety match to light when the striking surface on the box has become moist or worn out. This device consists of a tapelike roll several yards in length, provided with a striking surface, and placed in a circular container so that it can be drawn out as required. It is being applied to match holders, ash trays, and smokers' sets generally. When the exposed surface has been worn out all that is necessary is to pull the roll out to expose a fresh surface



How the Continuous Roll for Striking Safety Matches is Inserted in a Match Holder

and tear off the used part. The end of the roll is held in place by a metal clip. The roll is easily replaced when worn out.

WATCHES DESIGNED FOR USE ON AERIAL VOYAGES

Before the outbreak of the European war, when Lieut. John Cyril Porte, of the British navy, was pre-

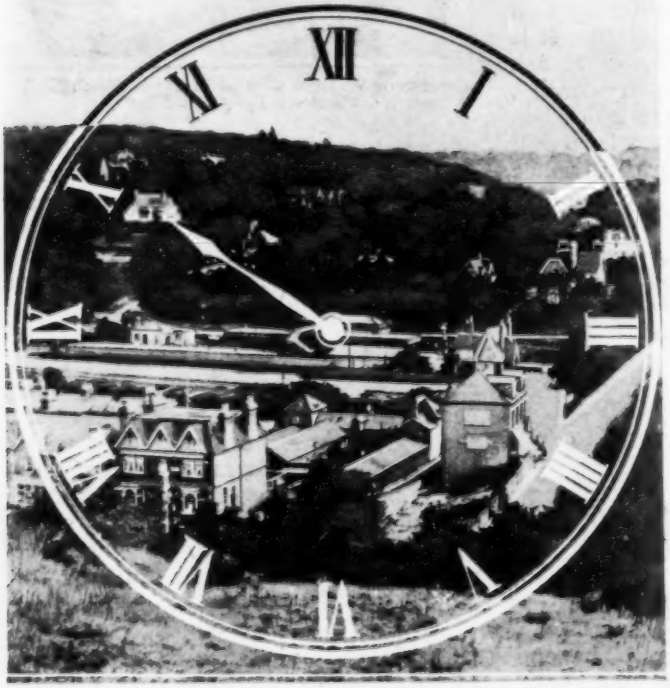
Aeronautic Watches Carried in Cases Which Strap about the Body of a Pilot

paring for his contemplated transatlantic air voyage in the flying boat "America," which was recently shipped to England for service on the continent, two watches intended to be used in making longitude calculations were constructed especially for him. The instruments are designed to furnish both astronomical and sidereal time, and are carried in a pair of leather cases which may be strapped about the body below the chest. The pockets of these are so made that, should water penetrate into them, it would be discharged immediately through small ducts in the bottom, so that the watches would not be injured or stopped.

¶Casein, the substance in milk which forms the basis of cheese, is now being used also as the base for so-called "cold cream" for toilet purposes.

HOW AN ARMY "FIRES ON THE CLOCK"

An ingenious method, known as "firing on the clock," is much used in the European war for enabling a military officer to concentrate the fire of his command on any particular point. This method consists simply in designating the object to be fired at by its position with reference to an imaginary clockface covering the landscape. The point that forms the center of this imaginary clock must first be understood all around, and a line passing upward and back from this point is, of course, the 12-o'clock line. Then when a command comes down the line to direct the fire at "white house, 10 o'clock," for example, or at "road, 9 o'clock," the rifleman or artilleryman knows definitely which particular white house or road is meant, and is able to direct his fire with the assurance that he is obeying orders.



An Imaginary Clock Covering the Landscape Enables a Military Officer to Concentrate the Fire of His Command Quickly and Accurately on Any Desired Point

LARGEST MODERN GUN OWNED BY ITALIAN GOVERNMENT

In view of the accounts of destruction wrought by the remarkable 16.5-in. siege guns of the German artillery, it is interesting to note that the largest modern naval gun has a bore of 17 in. and is owned by Italy. The instrument weighs 104 tons and hurls a projectile of 2,000 lb. Great Britain has a gun which, although slightly less in caliber, exceeds this piece in both muzzle velocity and power of penetration. When a missile leaves this gun it is traveling at a rate greater than 1,380 miles an hour, which enables it to pierce 3 ft. of wrought iron with ease.

SCORE BOARD FOR THE PANAMA CANAL

A wall board, 12 ft. long and 3 ft. high, on which is painted a map of the Panama Canal and its approaches, has been mounted in the port captain's office at each end of the canal, and push pins, each representing a ship, will be used in connection with this map for showing at a glance the status of traffic at any time. As soon as a vessel enters either end of the canal a report is telephoned to each port captain's office. A pin representing the vessel is then placed on the map, and as the vessel passes the different locks and Culebra Cut the pin is moved to the corresponding positions. The maximum speed at which vessels are allowed to pass through the canal varies from 6.9 miles an hour, in Culebra Cut and Miraflores Lake, to 17¼ miles an hour over a part of Gatun Lake.

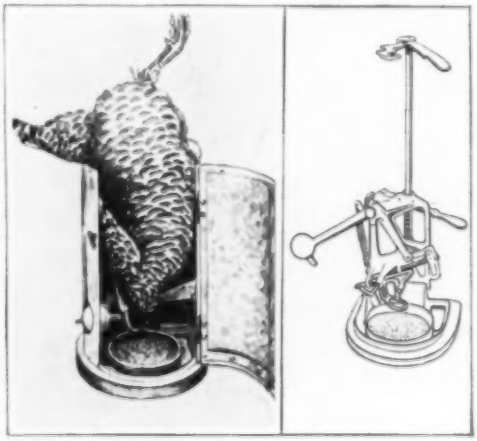
This Large Tree was Uprooted during a Storm and Hurled against the House, Partly Wrecking It

TREE HURLED UPON HOUSE IN VIOLENT STORM

During the course of a heavy storm at Stockton, Cal., a large eucalyptus tree was uprooted and thrown violently against one side of a two-story frame residence. The weight of the tree and its impact crushed in the roof of the house and wrecked one of the bed chambers so completely that had the accident occurred at night when the room was in use, its occupants undoubtedly would have been killed. The tree was more than a half century old, approximately 10 ft. in circumference, and a landmark of the town.

MACHINE FOR KILLING CHICKENS

A machine recently invented enables the operator to kill chickens, or other poultry, while they are concealed from view. In using this machine the fowl is placed, head down, in the casing which contains the mechanism, and the side door is closed. The legs of the fowl are held in a clamping device while the head is gripped by a ringlike device and a V-shaped collar. The mechanism is worked by a lever projecting from the casing. This lever operates a lance within the casing which penetrates the brain of the fowl, causing instant death, and also releases a pendulum device which strikes off the head.



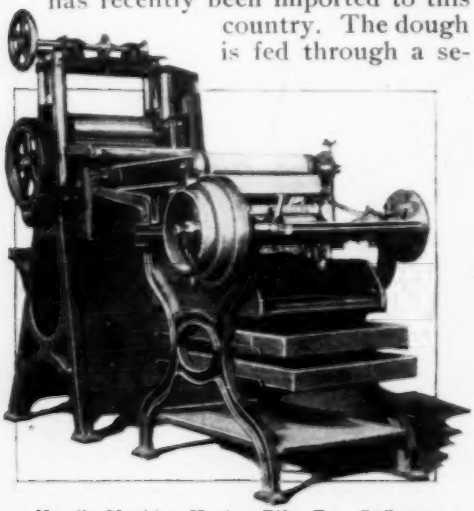
With This Machine the Chicken is Killed While Concealed from View

LONDON THEATER TAKES LIGHTER VIEW OF WAR

IN this novel war show, staged in a London theater, singers dressed in the costumes of the countries represented appear at openings in the map, which forms the background of the stage, and sing songs typical of the different countries.

MACHINE MAKES NOODLES IN MANY SHAPES

Fifty-two different shapes of noodles may be made on one machine which has recently been imported to this country. The dough is fed through a series of rollers, the pressure of which is regulated according to the thickness it is desired to make the pastry. A broad sheet of the dough is pressed out and run beneath dies which cut out whatever shape is desired, after which operation the noodles are dropped into trays which are placed in racks beneath the knives.



Noodle Machine Having Fifty-Two Different Sets of Dies

LINCOLN HIGHWAY BUILDING GOES ON RAPIDLY

Considerable progress was made during the last year in carrying ahead the work of building the Lincoln Highway, which when completed will reach from New York to San Francisco. The association which is furthering the project marked 2,500 of the 3,400 miles of road, and it is announced that the route is now in such a condition that it would be possible to make a transcontinental trip over it by motor car in less than a month's time. Forty thou-

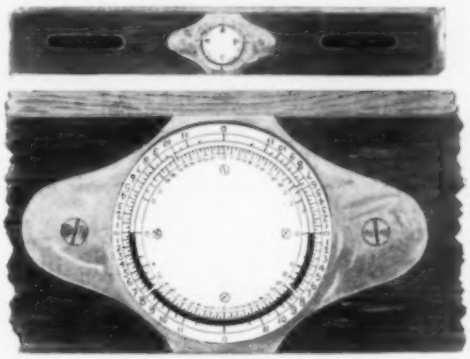
sand dollars' worth of cement was furnished by the promoting organization to different communities for use in road work, approximately three-fourths of the section passing through Ohio was paved, $350,000 in bonds for improvements, not previously anticipated, was issued by various communities in Indiana, while in Illinois, Nebraska, Colorado, and Wyoming much improvement work was accomplished.

ADJUSTABLE HEADPIECE ON COUCH HAMMOCK

Intended to be used in a sun parlor or on an open porch, a couch hammock is being made with a headrest which may be adjusted to three different reclining positions. The frame is made of steel and at the head end is provided with a brace, held by a bar and ratchet, which supports the mattress when it is held in a raised position. When it is desired to lift the mattress so that it is in a comfortable position for an afternoon siesta, or braced upright to suit a sitting position, it is only necessary to lift it and allow the bar to engage the proper notch. The hammock is supplied with comfortable springs, while its back and ends are made of a heavy duck. It may be suspended from hooks screwed into the ceiling, or from a collapsible stand which is provided for it.

NEW LEVEL TELLS GRADES IN TERMS OF INCHES

For the use of carpenters and various mechanics, a new level has been invented which indicates, in terms of inches or fractions thereof, to the foot, the deviation of a surface from either the horizontal or perpendicular. The instrument is provided with a pan half filled with red spirits and fitted with a



The Number of Inches to the Foot That a Surface Is Out of Plumb or Level is Indicated by This Instrument

Comfortable Swinging Couch Which may be Adjusted for Different Lounging Positions

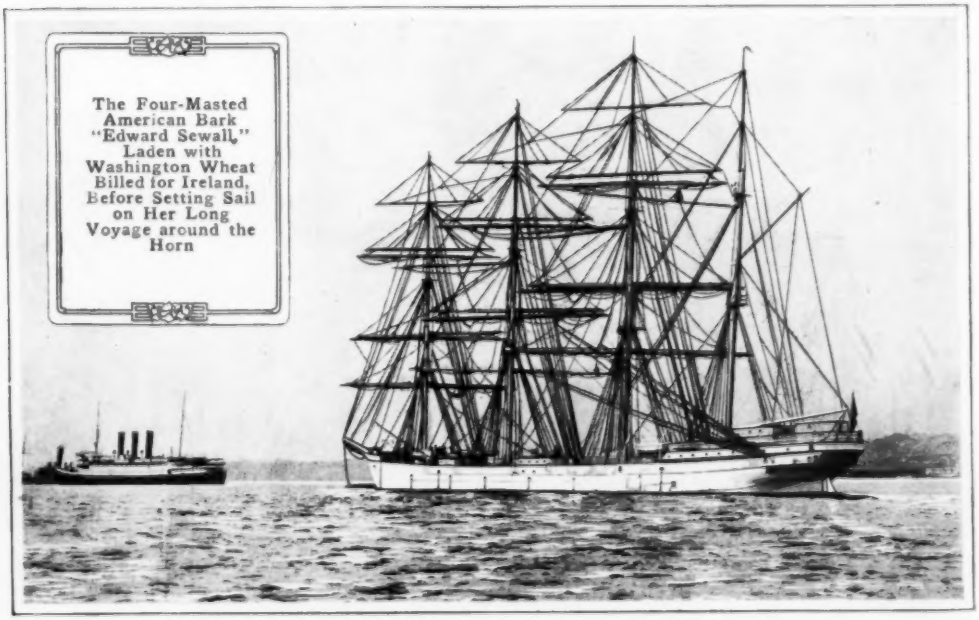
glass face, over which a dial carrying delicate graduations is fixed. This dial is composed of two scales, one within the other, the outer of which refers to horizontal calculations and the inner to the perpendicular. The graduations and their accompanying figures are etched in glass and traced with blue enamel, which, on account of the contrast with the red liquid, allows the dial to be easily read. The spirits can only be seen in a circular rim extending between the two scales. Since the liquid is necessarily always level it enables a carpenter to determine the pitch of a rafter, a porch-floor beam, or any other structural member, while it is also equally serviceable to a mechanic or mason.

WHEAT SHIPPED TO DUBLIN IN AMERICAN BARK

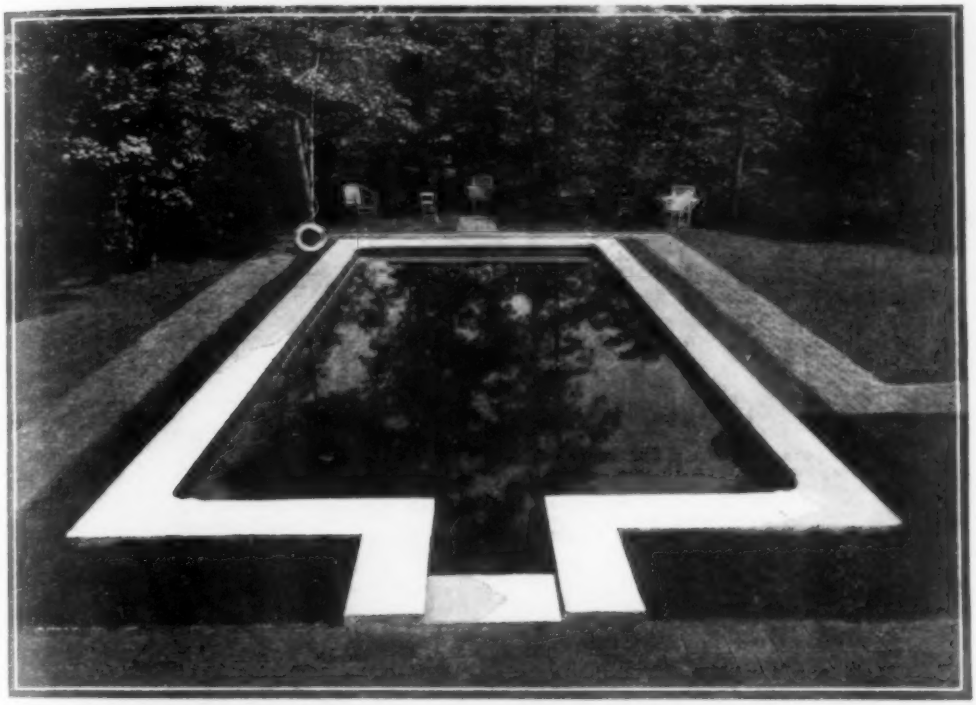
For the second time in a period of 12 years an American ship has departed from Puget Sound with a cargo of grain billed for an English port. Almost equally as interesting is the fact that this particular craft is a sailing vessel. A few weeks ago a trim, four-masted, square-rigged ship, the "Edward Sewall," slipped out into the Pacific laden with 183,475 bu. of wheat bound for Dublin, and commenced the long voyage to Ireland by way of the Straits of Magellan. While it was only a few years ago that practically all of the Pacific-coast grain shipments were consigned in sailing craft, today nearly all of the work is done by tramp steamers of foreign registry. European conditions, however, render it safer to ship in American bottoms than in others at the present.

CONCRETE SWIMMING POOL ON A COUNTRY ESTATE

A modern substitute for the "old swimming hole" is the concrete swimming pool, which is now considered a necessary feature of a well-equipped country estate. The pool is usually located in a wooded part of the estate, as is the one shown in the illustration, and is made attractive in every way. This pool is 14 ft. wide and 30 ft. long, and will easily accommodate 15 bathers at one time. At one end are steps leading down into the shallow end of the pool, the bottom of the pool sloping from a depth of 3 ft. at one end to 8 ft.



The Four-Masted American Bark "Edward Sewall," Laden with Washington Wheat Billed for Ireland, Before Setting Sail on Her Long Voyage around the Horn



On Well-Equipped Country Estates a Modern Concrete Swimming Pool Takes the Place of the "Old Swimming Hole"

at the other. The concrete walls rest on footings that are 9 ft. across, taper to 14 in. at the top and are capped with copings, while the floor ranges in thickness from 1 ft. at the deep end to 6 in. at the steps. A life preserver is always at hand, while seats are provided for the spectators when a swimming party is given.

TOOL-SHARPENING DEVICE FOR WOODWORKERS

For the use of carpenters, and other woodworkers, an instrument has been devised which makes it possible when sharpening a tool, such as a chisel or plane blade, to hold its cutting edge firmly against the surface of a sharpening stone at any angle desired while moving it with a rotary motion. To do this by hand without the aid of a guide is a difficult operation which frequently results in the rounding of an edge, giving the bit later a tendency to "ride" on the surface it is supposed to cut through. The new guide is designed with a metal holder for the sharpening stone, and an adjustable angular mounting for the blade, or bit,

Guide for Sharpening Chisels and Plane Blades

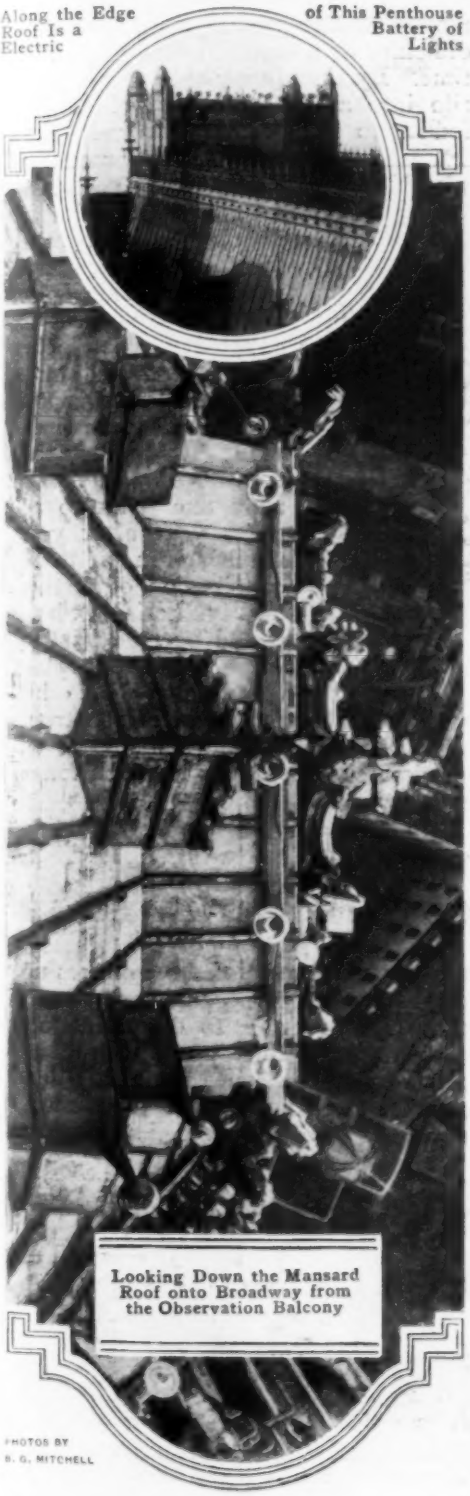
enabling an angle to be maintained throughout the whole sharpening process.

CONCEALED BATTERIES OF ELECTRIC PROJECTORS

Above is Shown a Cluster of Projectors Hidden in the Ornamentations on a Side of One of the Tourelles, While at the Right Is the Woolworth Building as It Now Appears at Night When Its Tower is Illuminated

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

ILLUMINATE TOWER OF WOOLWORTH BUILDING


Along the Edge of This Penthouse Roof Is a Battery of Electric Lights
Looking Down the Mansard Roof onto Broadway from the Observation Balcony
PHOTOS BY R. G. MITCHELL

BY a remarkable arrangement of reflectors, screens, and powerful batteries of lights, the tower of the Woolworth building, the highest inclosed structure in the world, now pierces New York City's skyline at night as a great white shaft reaching nearly 800 ft. above Broadway.

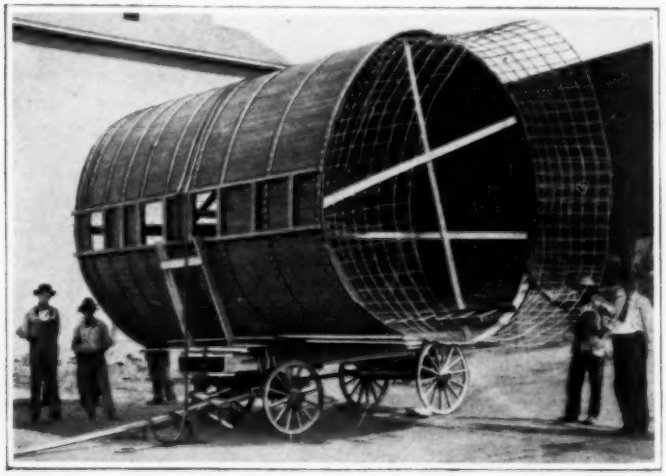
In order to make the building stand out in the darkness with the same majesty as it does during the daytime, the tower has been fitted with an elaborate system of hidden lights which illuminate almost every inch of its masonry. The work which has been accomplished represents an unusual example of illuminating-engineering skill, for in bathing every nook and crevice with light, the sources of this light have been hidden from view.

Approximately 600 projectors, each supplied with a 250-watt incandescent lamp, have been placed in various positions on the shaft so as to play their light over its surface. To illuminate the west side of the structure a battery of projectors has been arranged on the north and south sides of the penthouses at the thirtieth story and directed upward at different angles so as to throw the glare as far as the forty-third floor. To light the north and south sides of the tower a similar scheme has been carried out on the gabled roofs at the same floor, while to cover the east side the projectors are placed on a narrow balcony opposite the twenty-seventh story.

At the forty-third floor a set of lamps is placed so that the light is directed downward to cover the spots not illuminated by the lower batteries, while a complicated system of screening is employed to shield them so that they cannot be seen from the street. From the same floor and also from the forty-ninth, other lamps are focused upward to reach the fifty-third story, at which point the mansard roof begins. On the four tourelles opposite this floor there is a series of projectors that play the light upon the observation balcony at the fifty-eighth floor and cover the intervening space.

PORTABLE SILOS ARE USED BY MISSOURI FARMERS

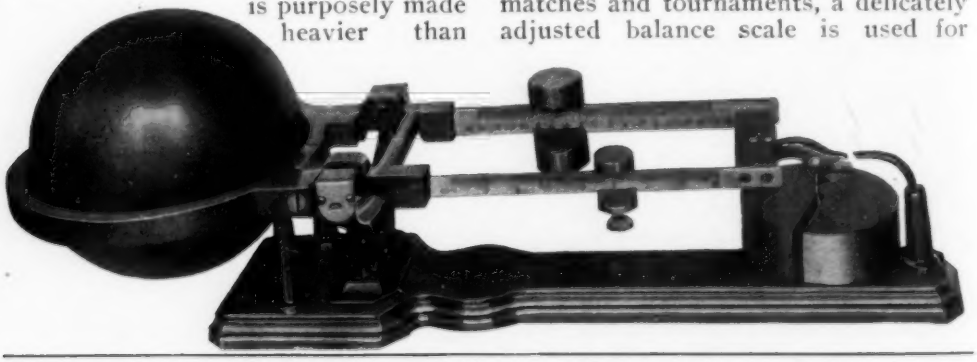
Portable silos are being used by a number of farmers in an agricultural community in Missouri where experience is said to have taught their value. They are so constructed that they may be placed on a wagon and moved to any part of a farm without difficulty or a material consumption of time. By thus being able to carry the silo into a field, the cost of hauling fodder to it is reduced as well as a considerable amount of time saved. The structure is built with fir flooring held together with wooden hoops, while the inside is reinforced to prevent its collapsing when being transported on a wagon. There is also a certain economical value in the fact that the silo may be moved from one point to another year after year, resulting in a better distribution of fertilizing material than would be true if stock were fed in one place continually. It has been found that the cost of constructing a silo of this kind amounts to approximately one dollar for each ton of capacity.



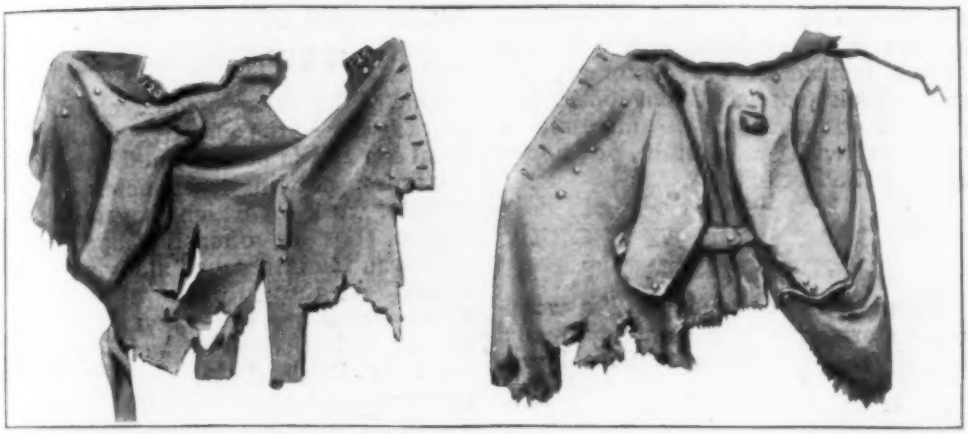
One of the Portable Silos Loaded on a Wagon Ready to be Hauled into a Field

WEIGHTED BOWLING BALLS DETECTED BY SCALE

Rules of the American Bowling Congress prescribe that the balls used in a game of tenpins shall not be loaded, exceed 16 lb. in weight, nor be manufactured in such a way that one side is purposely made heavier than another, a variance of three ounces not caused by tampering, however, being allowed. In order to determine certainly whether this specification is adhered to by the contestants in official matches and tournaments, a delicately adjusted balance scale is used for



Weighing the Various Sides of a Bowling Ball to Discover Whether It is Loaded



COURTESY L'ILLUSTRATION

At the Left Is a Coat Torn by a Bursting Shell, and at the Right, One Cut in Two by the Flying Slugs of a Hand Grenade. In Neither Instance was the Wearer Killed

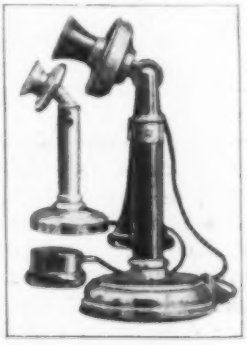
weighing the spheres. One end of this is made with a circular rim in which the ball to be examined is placed. Extending from this are two parallel bars, graduated in fractions of ounces, at the end of which is a balancing weight. By setting the two intermediate weights at zero, a ball weighing exactly 16 lb. will balance the scale. By then turning the ball to different positions and adjusting the weights on the bars, it is possible to readily compute the difference in the weight of opposite sides, as, for instance, the variance in the weight of the front and back, or top and bottom. This makes it impossible for a ball loaded with shot or lead on one side, yet conforming with the rules regarding total weight, to escape detection.

TORN COATS OF SOLDIERS TELL REMARKABLE STORY

Every modern war has had its many striking examples of soldiers who were saved from probable death by a prayer book, a uniform button, a watch, a coin, or some other article which broke the force of a bullet and prevented it from penetrating a vital part of the body. The present war has also offered almost unlimited examples of these curious escapes from mortal wounds. In the accompanying photograph are shown coats of two French uniforms, which are battle-torn to a degree that places their history almost in a category by itself. They were cut to shreds, one by the flying fragments of a bursting shell and the other by the slugs of a hand grenade. And the remarkable part of the story is that although the coats were torn beyond repair, the wearers were not. Both men lived through their experience.

SMALL TELEPHONE FOR DESK OPERATES EFFICIENTLY

What is possibly the smallest desk-telephone instrument in use has been made by a South Dakota man. It is shown in the accompanying photograph at the side of a standard instrument, which serves to illustrate its diminutive size. Although only 6½ in. in height and fitted with a transmitter diaphragm 1¾ in. in diameter, it is used for both local and long-distance work with results which are as satisfactory as those attained with ordinary apparatus. The only essential difference in its construction



and that of standard-sized instruments is that it is provided with a button switch instead of the customary receiver-hook switch. When it is being used it is necessary to maintain a pressure with a thumb or finger against the button.

SAILBOAT USED BY STORE AS ADVERTISEMENT

To advertise a "white sale," a western department-store company made use of the implied pun and displayed

How a Pun in the Concrete was Made Use of for Advertising a "January White Sale"

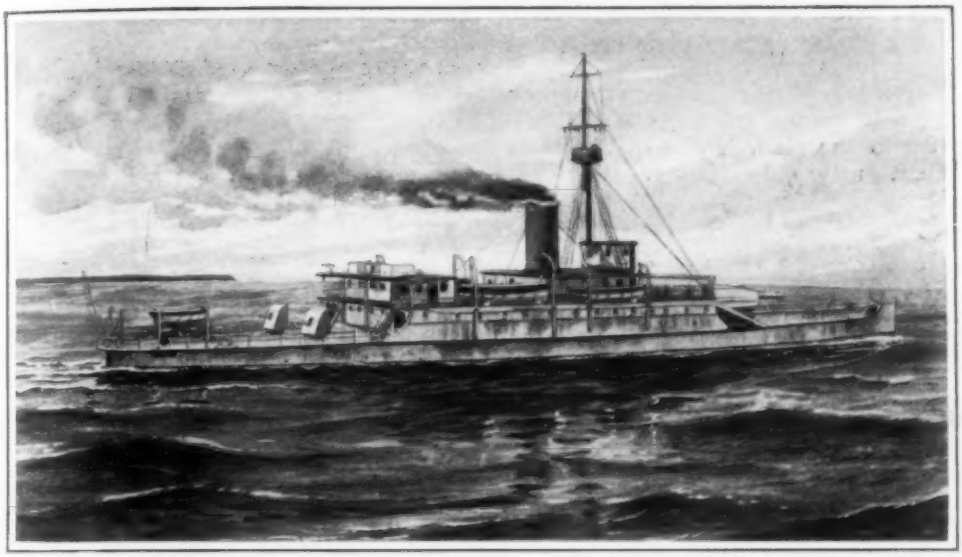
a fully rigged white sailboat over the entrance of its building. The craft was 25 ft. in length and carried a 30-ft. mast and 25-ft. boom to support the sails, which were made of 10-oz. duck. In order to lessen some of the pressure exerted against the sails and eliminate the danger of the yacht being blown down, holes were cut in the canvas to allow the wind to pass through. Whenever the breeze became too heavy the sails were taken in and everything made secure on deck, as was also done each night.

MONITORS OPERATING ALONG THE BELGIAN COAST

One of the unexpected developments of the war is the effective work that has been and is being done by modern monitors, not in coast defense, the class of work for which they were designed, but in offensive operations against a foe intrenched along the seacoast. At the outbreak of the war three monitors, the "Javary," "Madeira," and "Solimões," had just been built in England for the Brazilian government for service on the Amazon River. These vessels were taken over by the British admiralty and placed in service along the Belgian coast. They have since played what is probably the most important part in preventing the advance of the Germans down the coast to Calais and particularly in preventing the establishment of a German naval base at Zeebrugge.

These vessels have little resemblance to the original "Monitor," with its revolving turret, built in 1862 to fight the Confederate ironclad "Merrimac." The superstructure is like that of a gunboat, but each of the vessels has the low freeboard and deck of large area that characterize the monitor type and make in effect simply a steady, floating gun platform. Each monitor is heavily armored, has a displacement of about 1,250 tons and a draft of only 4½ ft. The armament consists of two 6-in. howitzers throwing a 100-lb. projectile at a muzzle velocity of 3,000 ft. per second, two howitzers throwing a 35-lb. projectile at a muzzle velocity of 1,150 ft. per second, four 3-pounders firing 30 rounds per minute, and six machine guns of rifle caliber. With this armament 1½ tons of metal can be discharged every minute. Each vessel has a speed of a little more than 13 miles an hour and can easily carry enough coal for a voyage from England to New York.

The shallow draft of the monitors makes them particularly efficient for work along the Belgian coast, as they can operate in shallow waters and are practically immune against torpedo



One of the Three Monitors Built in England for the Brazilian Government and Taken Over by the British Admiralty for Service along the Belgian Coast; This Vessel Is Capable of Throwing One and One-Half Tons of Metal a Minute and, Because of Its Shallow Draft, Is Practically Immune from Damage by Torpedoes or Anchored Mines

attack. Torpedoes are ordinarily adjusted to run at a depth of from 12 to 15 ft. below the surface, and unless they are specially adjusted to run almost awash they will pass harmlessly under these monitors, as was demonstrated when a German submarine fired four torpedoes at one of the vessels. For the same reason a vessel of this draft will pass unharmed over an anchored mine. In spite of the fact that the monitors were built for river service, they have proved so seaworthy that they have been able to keep at sea in the rough waters of the English Channel when larger merchant craft were compelled to seek shelter.

Although the monitor originated in this country, vessels of this type are not now regarded as especially useful units of our navy. There are 10 monitors in commission, on the United States Navy list, the latest of these having been built from appropriations made in 1898, but most of them are on reserve duty.

¶Steel pipe has so far displaced wrought iron that the production of the former is nearly ten times as great as that of the older material.

SPACES FOR FLOWERS MADE IN CONCRETE WALLS

In designing a residence driveway which was to be cut through a terrace, a builder avoided the monotony of having two long concrete retaining walls flanking either side by breaking them at intervals with semicircular niches in which plants could be placed. These spaces were made so that they broke what otherwise would have been the straight line of the two copings. Each was made about 3 ft. in depth and 2 ft. wide and given the same finish as the exterior of the wall. Concrete jardinières were made for the plants which were set in the spaces.

TATTOOING AS PRACTICED BY JAPANESE

Tattooing, the art of decorating the human body with pictures applied directly to the skin, is one of the most ancient arts. In Japan, where it

In Japan It Is a Matter of No Little Pride with Certain Classes to Possess a Body as Elaborately Decorated as This One

reached its zenith during the first part of the nineteenth century, it is a custom which antedates the earliest records of the people. Although still carried on there, it is done in secrecy, as since the beginning of the reign of the late mikado, Mutsuhito, it has been prohibited by law. Curiously, this modern edict against the practice corresponds to a similar command in the old Mosaic Law which put an end to it among the Jews centuries ago.

In Nippon this aboriginal custom has always appealed to the esthetic tastes of certain classes. At one time it reached a standing that placed its foremost practitioners in renown. Many of the famous painters of Japan were frequently employed to draw designs to be worked on the human body. Tattooing in Japan comes under three different classifications: the early practice of marking all criminals with characters which enabled the rest of society to identify them; the custom of lovers in their youth to have tattooed upon their forearms the names of their sweethearts in evidence of their undying fidelity; and lastly, "horimono," the practice of decorating practically the entire body with various elaborate designs. In northern Japan this is still persisted in, although the custom is said to be dying out gradually.

Horimono was never practiced among the higher classes of Japanese, but instead among those who on account of their vocations went for the most part unclothed, as was true of the jinrikisha men and many of the tradesmen, such as carpenters, plasterers, and the like. Singularly, the designs in this form of tattooing were influenced by the "irezumi," or the marking of criminals. The brand of the criminal was usually placed above the elbow on the left arm. For this reason the horimono practitioner has rarely decorated his clients' left arms, at least not heavily, beyond a point about two inches above the elbow, for fear that such a decoration might be construed as a covering for the label of the criminal.

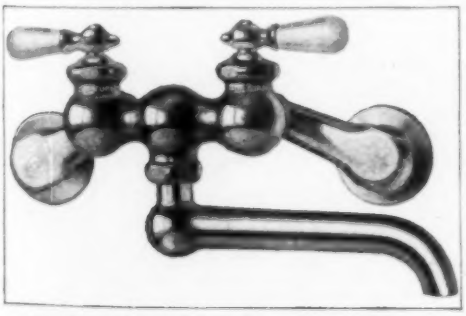
Since the process of tattooing, which consists of pricking the skin with a small bundle of needles and allowing the ink to enter the cuticle, is a very irritating operation, a body well covered with an elaborate design is displayed with considerable pride by the youth of certain classes, as it shows that its possessor has endured

no little pain. For the most part red and blue inks are used in the work, because neither of the colors fade nor is liable to injure the skin. The designs most frequently used are those in which appear a tiger, a dragon, a famous old warrior or beautiful woman, or even birds and flowers.

Elaborate work is even now an expensive means of decorating the body for the man of Japan who earns only a few sen daily. Frequently a pattern takes months to execute and formerly often represented practically the entire earnings of a person. It is interesting in this connection to note that many of these designs are used by the Japanese today in their outer garments. At one time exhibitions of tattooing were held and largely attended for much the same reason that fashion shows are given in this country at the present time.

COMBINATION WATER FAUCET WITH SWINGING SPOUT

Intended to be used over a kitchen sink, a combination water faucet has been designed with a long, swinging spout which may readily be moved from one side to another as desired. In addition to this feature it has the convenient property, characteristic of all similar fixtures, of joining the hot and cold-water pipes so that the water may be mixed to any specific temperature as it is drawn. The combined functions make the appliance a very convenient one for kitchen use.



The Spout of This Combination Water Faucet may be Freely Swung from Side to Side

FORM-LETTER AND CIRCULAR PRINTING MADE SIMPLE

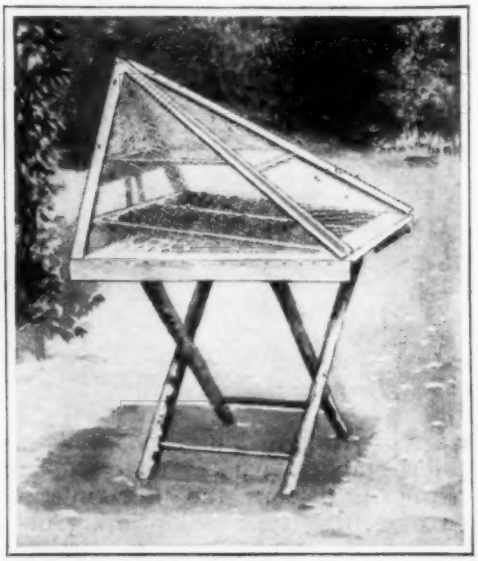
Intended particularly as an office appliance, a typesetting machine has lately been perfected which is operated by a typewriter, making it possible for a stenographer, wholly unversed in printing, to perform the entire operation of setting type and printing ordinary business circulars and similar matter. This machine occupies a space 22 in. wide, 3 ft. long, and about 4 ft. high. When the typewriter is used it not only performs its ordinary function, but also, through electrical connections made by the movement of its keys, actuates a mechanism which simultaneously sets the type for printing the matter which is being written. Each time one of the typewriter keys is struck an electrical contact is made, causing the corresponding character in type to be set. When once the type is set, which requires no more time than the typing of the copy, the printing is done in much the same way as is multigraphing. A type distributor is also a part of the machine, and this replaces the type in its proper channels after the printing has been run off with a speed of 250 characters a minute. The

Typesetting Machine Operated Electrically from a Typewriter

typewritten copy which is made in the beginning is used in reading proof. Corrections are made by rewriting a line in which an error appears and substituting it for the one previously set.

PYRAMIDAL GLASS CASE FOR DRYING FRUIT

A cheap but efficient fruit drier, now being introduced in California, is designed particularly for the farmer who



This Cheap but Efficient Fruit Drier Exposes the Fruit to the Sun on Three Sides

has only small quantities of fruit to dry. It consists of a table on which three triangular sheets of glass are mounted in the form of a pyramid, with the apex over the back of the table, and supported by a triangular sheet of galvanized iron erected on the back of the table. The inclosed space is exposed to the sun on three sides. The galvanized-iron back is provided with two small ventilators and with a door through which the trays of fruit are handled.

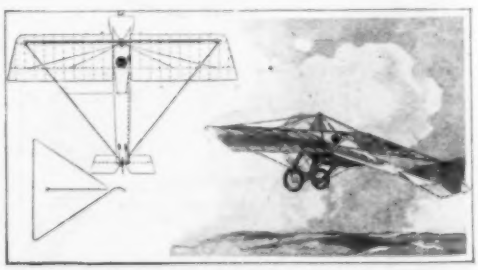
¶A new English postal regulation provides for the telephoning of the contents of important letters from the post office to the addressee on Sundays, for a small fee.

GERMANY AND BRITAIN BOTH BUILDING NEW NAVIES

Both England and Germany are building new warships much more rapidly than their navies are being depleted by war. According to an American naval expert who has had an opportunity of observing the activities in British shipyards, 15 new battle cruisers, the newest and heaviest type of dreadnaughts, will be completed for Great Britain in 1915, with a supplementary fleet of light cruisers, destroyers, and submarines enough to make a navy as large as that of the United States. With these new vessels added to England's sea strength and approximately the same proportionate additions to the German fleet, the American navy will be insignificant in comparison.

WIRELESS APPARATUS USED ON AEROPLANES

Radio communication between aeroplanes in flight and the signal corps of an army on the battle field, embraces a comparatively new phase of wireless telegraphy which is being given a thorough test by military airmen in the European theater of war. The plant consists of three units: a generator and spark discharger, a transmission system, and a portable receiving apparatus, the aggregate weight of which approximates 184 lb. As is shown by the ac-



Wireless Equipment for a Monoplane, Showing the Arrangement of the Antenna and Trailing Wire

companying illustration, the antenna is stretched over the upper pylon to the opposite wing tips of a monoplane, and back to the end of the fuselage, from

which the aerial trailing wire is dropped. This does not necessarily come in contact with the ground, but is extended close to it under ordinary circumstances. It is attached to the transmitting apparatus, but so controlled by a releasing device that should it become entangled in a tree or other fixed object on the ground, a slight jerk would be sufficient to disconnect it from the machine, thereby averting an accident. The entire plant is mounted in the cockpit of the craft, and the generator placed in such a position that it may be driven by a belt running from the monoplane motor.

FROZEN RIVER ROADBED FOR ELECTRIC RAILWAY

A novel means of transportation is used in Petrograd, Russia, during the winter months for relieving the congestion on the ordinary transportation lines. The river Neva, which flows through the city, freezes at the beginning of the season and remains frozen until the spring break-up. The smooth, solid surface of the frozen river furnishes an excellent location for a temporary but thoroughly practical electric railway, which is installed each year at the beginning of the winter and is kept in service until the ice shows signs of becoming unsafe.

Electric Railway Station on the Ice of the River Neva in Petrograd, Russia; This Railway is Built on the Ice Each Year and is Kept in Service throughout the Winter

ODD SIGNAL LAMP DEVISED FOR RAILWAY CROSSINGS

In different localities in the West a new danger signal is being used as an auxiliary safety device at railway crossings where gongs have been mainly depended upon in the past to warn traffic of approaching trains. The reason is that, while under most conditions a loud bell suffices, there are situations in which it is inadequate, a thing especially true in the case of motorists, who often open up their engines and cut out their mufflers on country roads, with the result that it is frequently diffi-

cult for them to hear a bell. The new signal consists of a red light which may be seen either during the daytime or at night. At the top of an iron pipe is mounted horizontally an 8-in. sheet-iron pipe, both the interior and exterior of which are painted black, and about the middle of which is a large red disk. Within the pipe, about 1½ ft. from the open end, is a red lens, and behind this an incandescent lamp backed by reflectors. When the lamp is ignited the red light may be seen for a half mile or more down a straight road, either at day or night. Its operation is the same as that of the average electric wigwag, the lamp lighting when a train enters a certain block, forming an electric circuit by contact with the rails.

SEA SLED RIDES AT HIGH SPEED WITHOUT SPRAYING OR SKIDDING

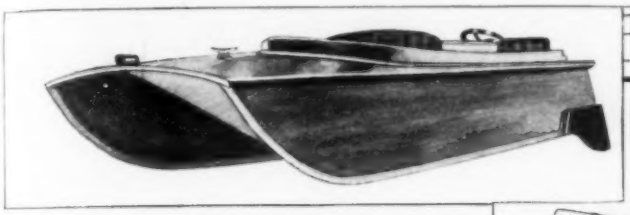
TAKING a spin on the water at a speed of 40 miles an hour with all the comforts of automobile riding is made possible by the sea sled, a new kind of high-speed craft that has just been developed. One of the features about this new kind of boat is that it does not throw spray on its occupants, as do most high-speed boats, but gathers the spray under the bow and rides on it. It does not trip or skid. It is not subject to knocks when running over choppy water, and the faster it is driven the more evenly it runs.

Instead of plowing through the water the sea sled rides on top of it, in this respect resembling a hydroplane, although its construction is radically different from that of a hydroplane. Instead of being flat or convex, the bottom of the hull is shaped like an inverted, rounded "V," while the bow, instead of curving to a point, is square and is of the same width as the stern. The original sea sled, shown in the illustration, was wider at the bow than the stern. Extending along each side was a plate having the appearance of a sled runner and serving to gather and hold the air and spray under the hull. With this construction the plates spread outward from stern to bow, resulting in water lines that spread outward instead of converging as in a displacement boat. This construction has been replaced by one in which the body of the boat is rectangular while the bottom is molded to provide the spreading water lines. In place of the usual submerged screw propellers the sea sled is equipped with "surface" propellers which dip a little less than half their diameters into the water when the craft is running at high speed. The rudders, of which there are two, are metal fins pivoted to the sides of the hull so that they project rearward from the stern. Each fin is carried, not on a vertical pivot, but on one that slopes downward and outward at an angle of about 30° with the vertical. The fins are worked separately by a horizontal rod which is moved back and forth horizontally by a gear at the center, this gear being controlled by a steering wheel of the usual type.

The sea sled is in effect a boat that has the bottom of its hull turned inside out, resulting in placing the keel higher than the sides. At the bow the opening between the hull and the water is made as high as the construction of the boat will permit for the purpose of catching as much air and spray as possible. Aft, the bottom is brought down to such a level as to give the boat a riding surface. With this arrangement there is no necessity for forcing air under the hull through pipes as is usually done with the hydroplane.

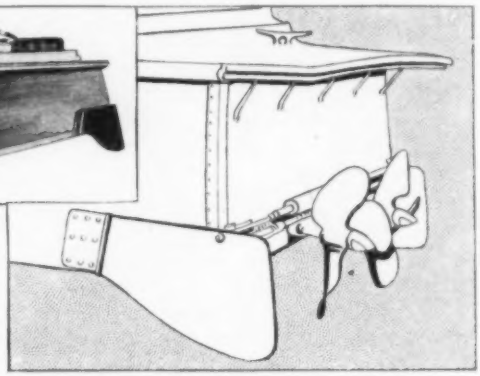
One result of this form of construction is that when the boat has a list it will steer of its own accord in the direction of the list and thus right itself automatically. When a displacement boat or hydroplane skids it is the bow that slides, and if the boat is going at high speed the result is almost

certain to be an upset. Take, for example, the case of a boat starting diagonally up the side of a big wave. If the boat has the usual displacement bow, the extra weight of water on the upper side will force the bow down toward the trough of the wave, a thing that can be prevented only by prompt and vigorous use of the rudder. A sea sled under the same conditions tries to nose in toward the crest of the wave and will continue to do this until its beam is on a plane parallel with that of the wave. The reason for this is found in the outspreading water lines. As the sides of the hull cut the water each throws a certain amount of water inward under the boat, with the result that there is an outward pressure on each side. The greatest outward pressure will be on the side where there is the greatest mass of water to be thrown inward, or on the side of the boat that is submerged the deepest. Full advantage of this tendency for steering purposes is taken by mounting the rudders on inclined pivots, as explained above. When the boat is to be turned to port, for example, the port rudder acts as an ordinary rudder and undercuts the water at the same time. This depresses the port side of the boat. The port side of the hull is then under the greatest outward pressure from the water so that the bow turns automatically to port, aiding materially in the action of the rudder. For this reason the sea sled is one of the easiest of boats to steer. It also presents the curious spectacle of listing, like a bicycle, in the direction of the turn.



This Picture of the First Type of Sea Sled Shows How the Hull is Shaped to Ride on the Water Instead of Plowing through It

In most racing boats and hydroplanes the propeller is submerged about 30 in. This makes it necessary to run the shaft through the bottom of the hull. This shaft with its fittings must be dragged through the water, and above a comparatively moderate speed, the power required for doing this may be more than that for driving the boat over the water. This resistance is done away with when surface propellers are used. The shafts of the two propellers, geared to revolve in opposite directions, are run straight out through the stern. This places the propellers so that only the portions below the shafts are submerged, but the loss of driving power due to this cause is largely counteracted by making the blades of large area. An incidental advantage in the surface propeller is that the boat can be run in shallow waters, and among weeds and water plants.



The Arrangement of the Steering Fins and Surface Propellers

The greatest speed yet made by a sea sled is around 43 miles an hour. At higher speeds than this the boat gets to planing so high that it loses its planing surface—that is, the air escapes suddenly from the cavity under the boat and it drops back to the water. It is thought that this restriction in speed may be overcome by further improvements in the shape of the hull. The ordinary hydroplane works satisfactorily at weights not in excess of 45 lb. to the horsepower, while some of the latest sea sleds are capable of running at high speed with weights of as much as 70 lb. to the horsepower.

LAWN SPRINKLER THAT WETS A LARGE AREA

A new lawn sprinkler is designed with the idea of enabling one man to take care of several acres. The sprinkler proper consists of several lengths of pipe joined together, making a string of any desired length. The pipes are perforated and in each perforation a small nozzle is set, while the supports are such that the pipes can rotate back and forth easily. The pipes are supplied with water through a small hydraulic device carried on a two-wheeled truck, and this device swings back and forth under the pressure of the water. The pipe line is rigidly attached to this so that the tiny streams of water are constantly thrown back and forth across a strip 50 or 60 ft. wide. When enough water has been supplied to the strip, the pipes are disconnected and laid across racks on the truck, and the whole is trundled to a new location.

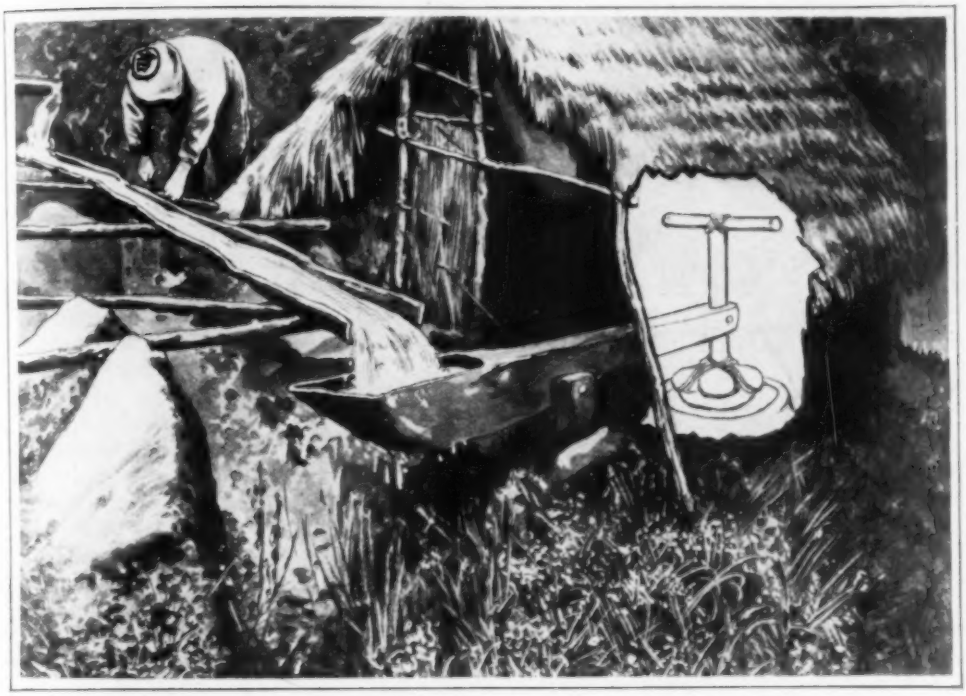
A Hydraulic Device on the Truck Rotates the Pipe Back and Forth so That Water is Supplied Evenly to a Strip 50 or 60 Feet Wide

HEAT-EQUALIZING DEVICE FOR STEAM SYSTEMS

Designed for use with underground steam systems, such as are employed in serving groups of buildings or apartment houses from a central plant, a new method of heat distribution has been devised which bears essentially the same relation to large heating systems as high-tension feed wires bear to electric-transmission lines. The purpose of the apparatus is to equalize the heat so that buildings situated at a distance from the supply station will be served just as efficiently as those close to it, which is not always the case with a low-pressure system used in this manner. In the new plan a small, high-pressure tube is contained within the ordinary supply pipe and at stated intervals is fitted with automatic valves which operate whenever the pressure in the larger conduit falls below a certain minimum, feeding in a sufficient quantity of steam to equalize the heat at the required points. The system can be installed in old plants.

HOW JAPANESE USE WATER POWER TO HULL RICE

A crude but effective apparatus for utilizing water power in hulling rice is in common use in the rice-growing sections of Japan. It consists simply of a beam that rocks on a pivot and has a bucket at one end and a pounder for hulling the rice at the other. The



This Crude Water-Power Plant Works Slowly but Needs Practically No Attention

water is supplied through a trough, which empties into the bucket, and no head is required other than that necessary for maintaining the flow. As the bucket fills, the weight of the water forces it down, raising the pounder at the other end of the beam. The bucket is so shaped that when it reaches the low point the water spills out suddenly and the beam flies back to its original position, the pounder falling into the bowl-shaped receptacle with sufficient force to break the hulls from the rice. The apparatus works slowly, but requires practically no attention.

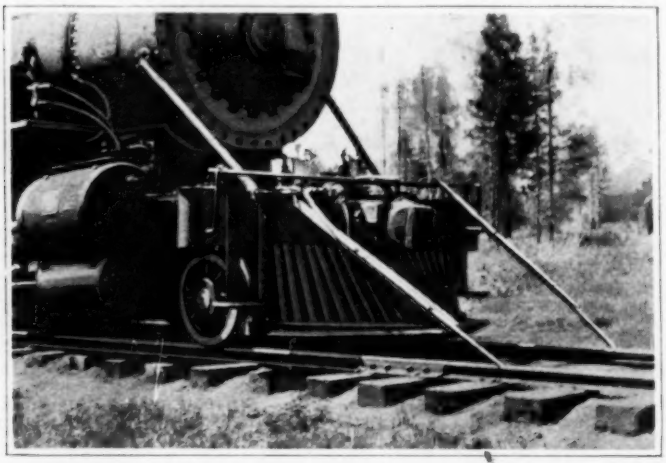
FLOWERPOTS ORNAMENTED WITH SEA SHELLS

The making of flowerpots from sand and cement in which sea shells, picked up along the ocean front, are imbedded is a novel occupation followed by an old man near San Diego, Cal. With the many kinds of shells picked up a great variety of effects are produced. In some cases the shells are left sticking to the outside of the flowerpot, and in others they are sunk into the composition so that the rims are flush with the surface. Ordinary dishpans are used as molds, and some novel and attractive patterns are worked out for sale to tourists and beach residents.

These Flowerpots are Made of Sand and Cement and are Decorated with Sea Shells Sunk into the Composition While It Is Wet

CLEARING RAILWAY TRACKS OF CATERPILLARS

During an almost unprecedented plague of caterpillars in northern California, railroad tracks were so thickly covered with the small, hairy creatures that in some parts the movement of trains was seriously interfered with and sometimes became dangerous on heavy grades where it was impossible to prevent the wheels from slipping even when the brakes were locked. The problem of clearing the tracks of the pests in advance of a train was solved by extending two pipes ahead of the pilot of the locomotive and directing a high-pressure jet of steam on each rail. The steam was expelled with sufficient force to blow the caterpillars from the track, while its heat was great enough to kill them almost instantly. This simple method put an end to the difficulty and saved the expense of cutting ditches for miles to prevent grubs from crawling to the rails.



By Blowing Steam through Pipes from the Locomotive Boiler to the Rails, Caterpillars were Cleared from the Railway Tracks without Difficulty

ONE-MAN HOUSE A CURIOUS STRUCTURE

When the authorities ordered the removal of a partly completed wooden building in a suburb of Cincinnati, a novel building enterprise on which a civil-war veteran had worked for seven years, and to which he had devoted the most of his pension money, was rudely brought to an end. Every board was cut and every nail was driven by this man working alone. He called it his "White House." When the structure had begun to take definite shape, and its crude lines were seen to follow the contour of the executive mansion in Washington, the reason for this name was apparent. This one-man house was within a few weeks of completion when two inspectors appeared on the scene. The house was found to have been built in violation of the building ordinances, and an order was issued for its removal. The man who built it then proceeded to tear it down, saving the material carefully for use on another location. When only as much of the building as is shown in the illustration remained standing, he quit work.

Corner of "White House" Built by One Man and Then Torn Down by Him When the City Authorities Ordered Its Removal

SURE-FOOTED BURRO REPLACED BY MOTOR CAR

THIS photograph shows a motor car at the apex of Eagle Rock Mountain, a peak with very precipitous sides, near Los Angeles. The feat of climbing it is one which requires not only an engine with power, but also brakes that hold and a driver with a clear head, as may be appreciated by the position in which the machine is standing, one of its wheels being within a hair's breadth of the edge of the cliff. This spectacular piece of hill climbing was accomplished for the purpose of demonstrating the flexibility of a stock car, and also illustrates in a striking manner the tremendous advancement made in gasoline-propelled vehicles.

ARTISTIC LAMP-POST MADE FROM LIMB OF TREE

In front of a California bungalow is a rustic lamp-post which is not merely odd in appearance, but also fits well with its surroundings. It is made from a crooked limb of a tree and is surmounted by an artistic lantern made of brass. The electric wires are run under the ground through a conduit and up through the interior of the post, which has almost the appearance of having grown in its position instead of having been placed there. The novel effect obtained is not unpleasing, although somewhat startling when first observed.

THE TWELVE-CYLINDER CAR NOW A POSSIBILITY

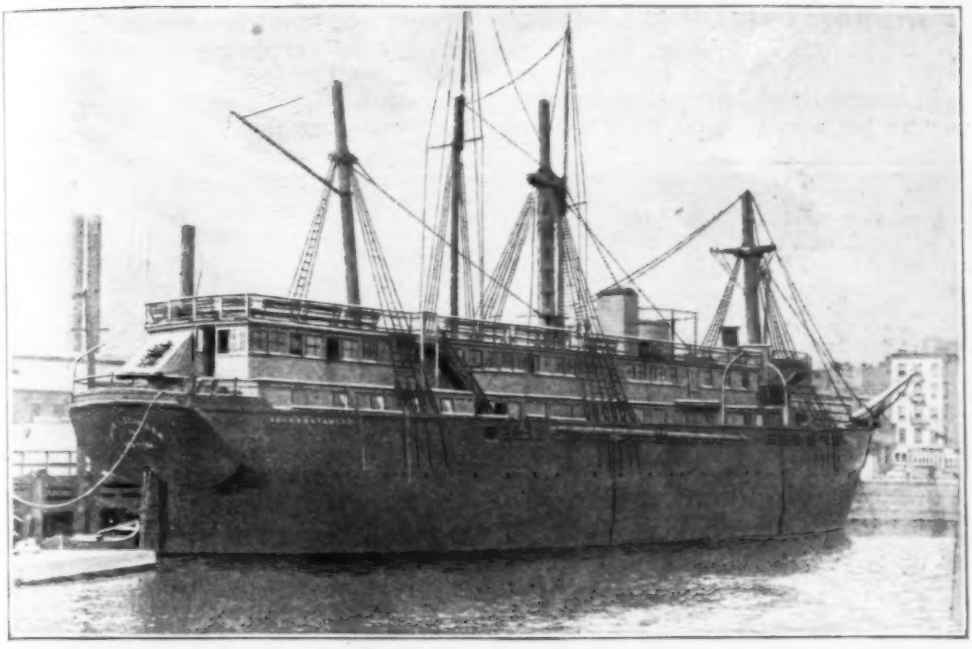
With the eight-cylinder car barely introduced, automobile manufacturers are now talking of the 12-cylinder car, one maker having already thrown out the hint that "if the public demanded a 12-cylinder car," his company was prepared to make it. There were 14 eight-cylinder cars exhibited at the automobile show held in Chicago in January, 1915, but so far as is known there is only one 12-cylinder model in existence, and that is a British racing car. Just whether the advantages to be derived from the use of 12-cylinder engines will compensate for the increased complexity of the mechanism is a thing that can be determined only by experience.

TO EXHIBIT ALBINO CATTLE AT SAN FRANCISCO

Some of the famous Chillingham white cattle are to be exhibited at the Panama-Pacific Exposition if plans now being made are carried out. The ancestors of this herd were shut up in Chillingham Park, England, in the year 1220, and since then there has been no infusion of new blood and no change in the characteristics of the cattle. They are albinos, with snow-white bodies, black noses and horns, and red ears. These cattle are an albino offshoot from the aurochs, the extinct black wild ox from which all the domestic cattle of Europe are descended, and they still show traces of their descent in the colored nose, horns, and ears. The albino trait has been preserved for nearly eight centuries only by keeping them rigidly separated from other cattle.

STAMP-VENDING MACHINES USED IN CANADA

Combination letter boxes and vending machines that dispense one-cent and two-cent stamps are being introduced by the Canadian government. When a coin is deposited in the machine the stamps are fed forward from a roll and are torn off in a strip by the purchaser. As soon as the supply is exhausted, a metal shield bearing the word "Empty" drops over the coin slot. The machine is operated by electric current, which also furnishes the light for illuminating the advertising placed around the top.



New York's Floating Hotel Which has been Raised and Again Opened as a Home for About 75 Girls and Young Men

SCHOONER HOTEL FOR NEW YORK POOR

One of America's odd hotels, a five-deck schooner which served as a home for some 75 girls and young men employed in New York, has been raised and again put in service. Several months ago, while taking on a supply of coal, the boat sprung a leak and settled into the mud at its mooring place in the Hudson River at the foot of East Twenty-Third Street. The vessel is an obsolete, timbered craft which has seen more than 50 years of service and is owned by the estate of a famous coffee merchant. It is not operated for profit, but to provide an economical home for worthy young persons. For 12 years the boat has been moored at its present dock, and all that time served as a hotel. It has its own electric-light plant, dining, smoking, and recreation rooms, and is comfortably fitted and heated.

¶Lightning, campers, locomotives, and incendiaries, in the order named, are the most frequent causes of forest fires.

CHISEL TESTED BY DRIVING IT THROUGH STEEL BAR

A hand-forged chisel with a tapered point, made from cropped ends of steel such as are used in shrapnel cases, was recently driven through a 2-in. cold steel bar with a sledge. The operation required only 15 minutes and was performed by a blacksmith and his helper, the one holding the chisel with a pair of tongs and the other wielding the sledge. After penetrating the block of steel the chisel was withdrawn and found to be in perfect condition, neither end of the tool showing any marks which would indicate that it had been used.

FUNERAL CAR OF JAPANESE EMPEROR

An ancient and impressive Japanese custom brought to light by the death of the late emperor is that of building the imperial funeral car. When an emperor dies, a new funeral car is always made. It must be built to exacting specifications and only by members of one family, in which this duty has been a hereditary honor for generations. The length of the car is always 23½ ft.; the width, 10½ ft., and the height, 12 ft. The wheels are of unusual pattern, each having a rim built in seven sections, with the idea of doing away with all jolting. There are three spokes to each section, and the sections are joined by plates placed on the inner side of the rim. The result is rather curious in one way, since each section has a separate and distinct squeak. The car is drawn by two oxen with three in reserve following the car. The car must be strongly built, as the emperor's coffin weighs between four and five tons, consisting of three caskets placed one within the other. The inner casket is made of Japanese wood, 3 in. thick, and covered with vermilion. This casket is placed in the second casket, and the intervening spaces are filled with charcoal. These are then placed in the outside casket, and the spaces are filled with granite.

COPYRIGHT, UNDERWOOD & UNDERWOOD

One of the Wheels of a Japanese Imperial Funeral Car: The Rim is Made in Seven Sections with the Result That the Wheel Has Seven Separate and Distinct Squeaks

SHORT CUT ACROSS CANADA FOR SEAGOING VESSELS

The next great waterway scheme to be carried out, according to present indications, is the Georgian Bay Canal, which is to connect Georgian Bay with the St. Lawrence River at the head of navigation for seagoing vessels near Montreal. This canal will not only give vessels from the Atlantic direct entrance to Lakes Huron, Michigan, and Superior, but will reduce by nearly one-half the distance traveled by water-borne shipping in going from the northern part of Lake Huron to Montreal, eliminating the present indirect route by way of Detroit, Lake Erie, the Welland Canal and Lake Ontario. The canal will utilize for the greater part of its length a continuous chain of natural lakes and rivers. The total length is 449 miles, and over only 30 miles of this will it be necessary to construct a new waterway, although much of the existing waterways will require dredging. The total cost of the canal is estimated at less than $150,000,000.

The canal begins in Georgian Bay at the mouth of the French River and follows up this river to Lake Nipissing. In this 83-mile stretch there are to be three locks with a total lift of 70 ft. Lake Nipissing to the St. Lawrence is 633 ft. The canal is to be 200 ft. wide at the bottom and to have a maximum depth of 22 ft., while each of the locks is to be 850 ft. long and 65 ft. wide

Proposed Georgian Bay Canal, 449 Miles Long, Which is to Connect Lake Huron with the St. Lawrence River and Provide Direct Access for Seagoing Vessels to the Great Lakes Ports

At North Bay, on Lake Nipissing, extensive wharves and grain elevators will be built. A canal connecting the east shore of this lake with the Mattawa River will be excavated. This canal will pass through Turtle, Talon, and Trout lakes and will comprise the heavy portion of the excavation. It is planned to lower these lakes to the level of Lake Nipissing and to make the latter the summit in order to utilize its inexhaustible water supply for lockage purposes in both directions. In the 13 miles of the Mattawa River are two waterfalls, the Paresseux and Les Chines, and these will be passed by a series of five locks. The waterway then follows down the Ottawa River, in which a total of 15 locks will be installed. The last lock is at the lower end of the Lake of Two Mountains, which is the outlet of the Ottawa River into the St. Lawrence River. Leaving this lock, the route follows Back River on the north of Montreal to a junction with the St. Lawrence River at Bout de l'Isle, about 12 miles below Montreal. By using Back River the construction of a new channel and of wharves in front of Montreal sufficient for handling the enormous traffic that will use the new route is avoided, while a new and important commercial frontage will be opened along the north side of the city. The total fall from and to have a depth of 24 ft. of water over the sills.

The hydroelectric power that can be developed along the canal is estimated at 1,000,000 hp., and it is believed that with the growth of new towns and industries the sale of this power will provide a revenue sufficient to pay most of the interest on the investment for building the canal. About 70 hours will be required for making the journey from Georgian Bay to the St. Lawrence River. It is estimated on good authority that the trade flowing from the Great Lakes to the Atlantic seaboard at present represents 72,000,000 tons a year and that this is doubling itself every six years. About 80 per cent of this shipping is American-owned, and a large part is now diverted at Buffalo and shipped to Atlantic ports by rail.

DOORS OF STOCKMAN'S BANK PICTURE RANCH LIFE

Each of the doors designed for a recently completed bank building at Austin, Tex., which is owned by a stockman, is divided into three bas-relief panels depicting scenes typical of those on southwestern cattle ranches. Together they weigh approximately 2,600 lb. and represent an expenditure of $4,000. Photographs were taken on

one of the ranches owned by the cattleman, and these were used by the artist in laying out his work. At the

These Bank Doors Picture Scenes Typical of Those to be Seen on Southwestern Cattle Ranches

top of the doors appears a group of cowboys; in the middle, a round-up; and at the bottom, a typical grazing scene. Small bronze heads of steers with lasso nooses about their necks form the knobs for the doors.

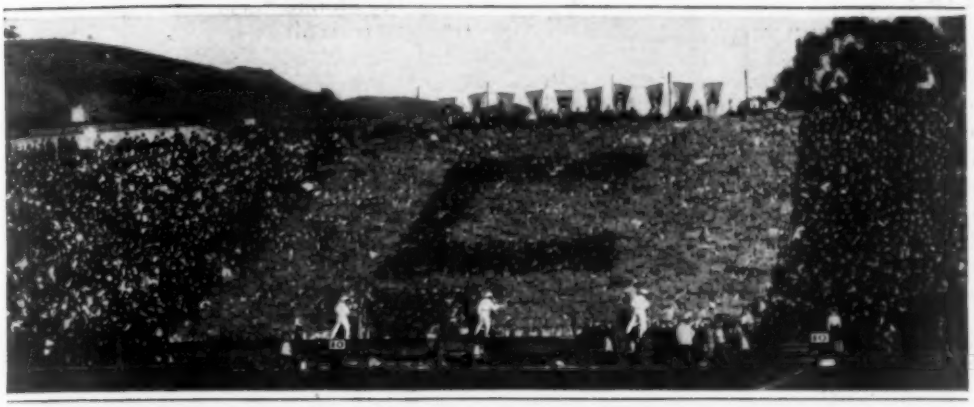
OXYGEN MAY BE STORED WITHOUT PRESSURE

By the use of some of the commercial preparations of fused sodium peroxide, oxygen can now be stored without pressure. This substance has the property of holding oxygen in chemical bonds, from which it is released by the action of water. A pound of the peroxide will hold 2.2 cu. ft. of gas, or enough to supply the breathing requirements of a man for 30 minutes. The application of this discovery to diving and life-saving appliances is said to be entirely practical, since the sodium peroxide, while hard, is not brittle, and can be cast into any convenient shape. When charged with oxygen it may be stored without danger of deterioration if protected from moisture.

MUCH PIPE WOOD IS USED BY PENNSYLVANIA

Pennsylvania leads all of the states in the consumption of wood for use in the manufacture of pipes. Of the different kinds of material employed, apple wood is in greatest demand, for it is the principal wood used in making the so-called brier pipe. The accompanying photograph shows the evolution of an ordinary pipe bowl from a blank of brierwood, which is purchased at about $350 a thousand feet. The other woods that are used, aside from this and apple, are red gum, ebony, birch, and olive. The state each year consumes in pipe making the equivalent of approximately 225,000 board feet of timber, the average price of which amounts to about $65 a thousand feet.

The Evolution of a Pipe Bowl from a Slug of Brierwood



The Great "C" Formed in Blazing Color by University of California Students at a Football Game

DISPLAY COLLEGE COLORS IN SPECTACULAR WAY

At a hotly contested football game between the University of California and Leland Stanford University, a very striking method of displaying their colors was adopted by the "rooters" of the former institution. The students were seated in a solid block on the bleachers, and each held a rectangular flag which was blue on one side and yellow on the other and held at either end by a stick. In the center of the block a series of the seats had been marked off to form a large "C." In this way the rooters were divided into two groups, those forming the "C" and those constituting the background. Then, by each student holding back his flag so that it covered his head and shoulders, every one in that section of the bleachers was hidden from view beneath a glare of color. When one group of the rooters were displaying the yellow side of their flags, the other would display the blue. So the great "C" in the center appeared one minute in a brilliant yellow and the background in blue, and the next minute in blue with a yellow background. The changes were made in unison, each rooter following the direction of the cheer leaders.

¶A metronome watch for gauging the speed of marching troops has been introduced in the Austrian army.

HOUSE IN NETHERLANDS HAS ROOMS THREE FEET WIDE

So valuable is land in the crowded countries of Europe that even a space, 4 ft. wide, between two buildings in one of the main thoroughfares of Amsterdam, Netherlands, is made to serve as a dwelling. The thickness of the walls eats up a foot of this space, so that this strange house is only 3 ft. wide inside. The front of the lower floor is occupied by the stairway. In the narrow rooms of the upper stories a family lives in comparative comfort.

¶An aeroplane recently built for the Italian army has engines of 300 hp., a lifting capacity of 11,000 lb. useful load, a speed of 75 miles an hour, and is capable of sustained flight for 25 hours. Two other giant planes, one of 600 hp. and the other of 1,000 hp., are also being built in Italy.

STANDING PLATFORMS USED BY TRAFFIC OFFICERS

For the comfort of traffic policemen, who in bad weather are forced to remain for several hours at a time on wet or frozen pavements unless special provisions are made for them, small standing platforms have been devised by the police board and put in use at some of the street intersections at St. Louis. They are made of slats, an inch in thickness, nailed to crosspieces that raise them from the pavement so that there is an air space beneath. These platforms are approximately 3 ft. square and are placed in positions from which the policemen may direct the traffic without difficulty.

PROPER ELECTRIC WIRING FOR MOTOR CARS

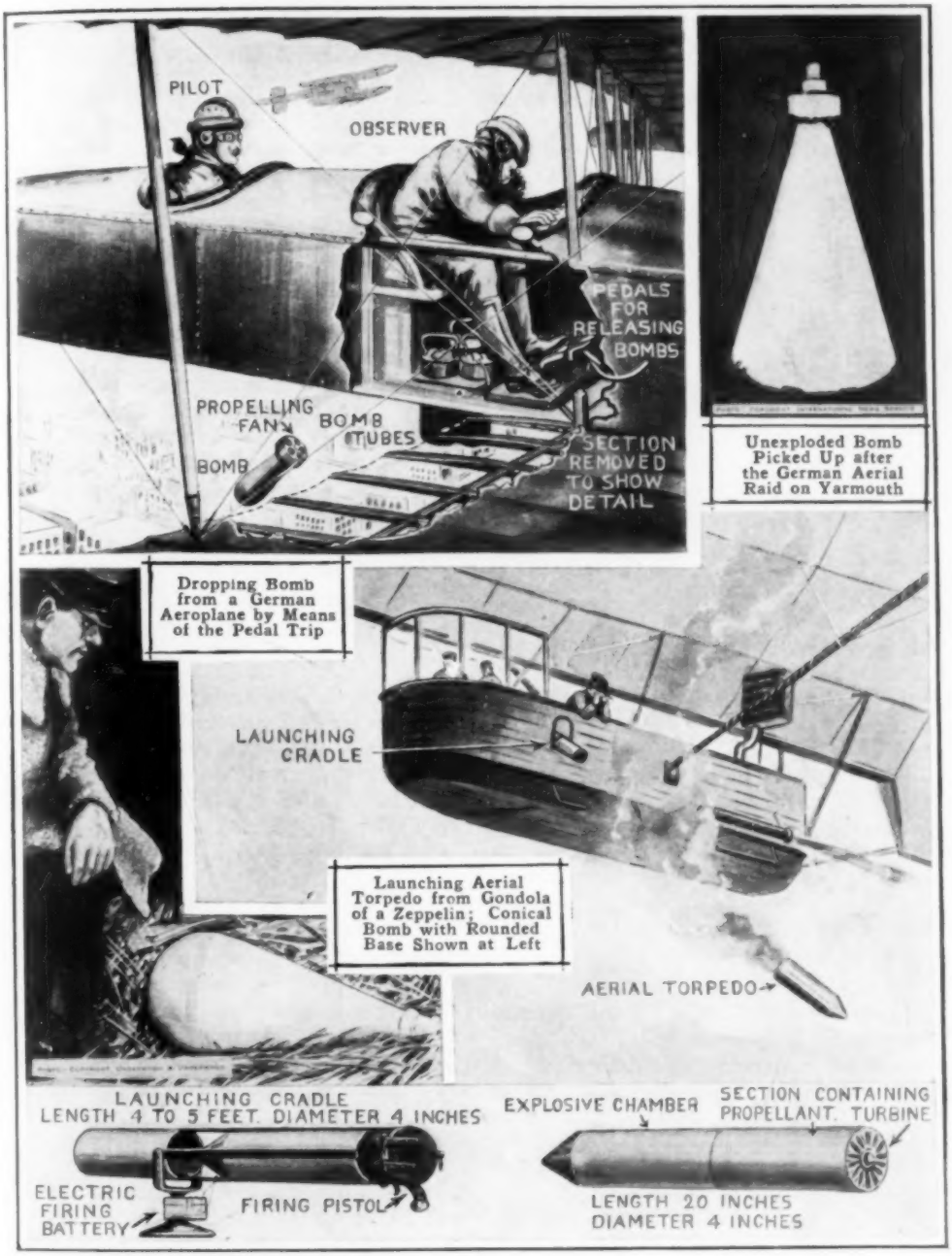
Attention has lately been drawn to the relative merits of single and double wiring of electric-lighting equipment on motor cars, and the good opportunity afforded by the metal chassis of a machine for grounding has caused the single-wire system to be suggested as possibly preferable to that now in general use. One of the reasons for this is that more substantially insulated connections could be made at the lamps. It is also always possible in double wiring for leaks to occur which are not great enough to blow a fuse, but sufficient to cause a drain on the battery. With the single-wire system the fuse is burned out almost always by a short circuit, and this gives an immediate warning of trouble, enabling it to be looked after before damage is done.

¶A cement for fastening metal to marble is made of 30 parts plaster of paris, 10 parts iron filing, and ½ part of sal ammoniac, mixed and reduced to a paste with acetic acid.

TORPEDOES AND BOMBS USED IN AERIAL RAIDS

A new instrument of destruction brought to light by the German airship raids on England is a self-propelled aerial torpedo that in many ways resembles a submarine torpedo. It is launched from the gondola of a Zeppelin through a special launching tube that is mounted on a universal joint so that it can be swung at any angle and fired in any direction. The torpedo is launched from this tube by an electrical device operated by a trigger, and, with proper allowance for the speed of the Zeppelin, the shell can be hurled at a given mark with great accuracy. Its great advantage lies in the fact that it can be fired forward, broadside, or astern, and not simply dropped, as is the case with the old-style aerial bomb.

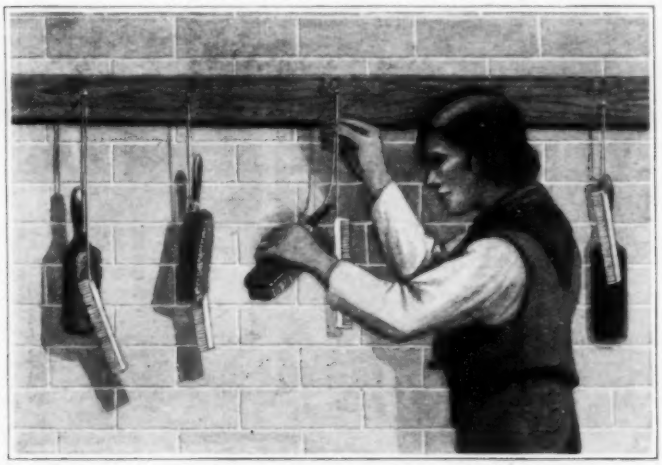
The torpedo consists of a pointed shell, approximately 4 in. in diameter and 20 in. long. In the nose is carried a high explosive, thought to be trinitrotoluol, which is fired by a percussion cap on contact. Back of the explosive is a compartment containing about 4½ lb. of a slow-burning compound which is probably composed of sulphur, saltpeter, charcoal, and a vegetable oil. When ignited, this compound gives off gases which operate the turbine at the rear of the torpedo. The turbine drives the torpedo through the air at high speed and also gives it a rapid rotating motion similar to that of a shell fired from a rifled cannon. The burning compound leaves a trail of smoke behind the torpedo, but produces no flame, so that there is little or no danger to the airship from the firing of the torpedo.


PILOT
OBSERVER
PEDALS FOR RELEASING BOMBS
PROPELLING FAN
BOMB TUBES
BOMB
SECTION REMOVED TO SHOW DETAIL
Unexploded Bomb Picked Up after the German Aerial Raid on Yarmouth
Dropping Bomb from a German Aeroplane by Means of the Pedal Trip
LAUNCHING CRADLE
Launching Aerial Torpedo from Gondola of a Zeppelin; Conical Bomb with Rounded Base Shown at Left
AERIAL TORPEDO
LAUNCHING CRADLE
LENGTH 4 TO 5 FEET. DIAMETER 4 INCHES
ELECTRIC FIRING BATTERY
FIRING PISTOL
EXPLOSIVE CHAMBER
SECTION CONTAINING PROPELLANT. TURBINE
LENGTH 20 INCHES
DIAMETER 4 INCHES

In addition to these, the Zeppelins, as well as the German aeroplanes, carry the ordinary aerial bombs which are simply dropped. Until recently these were thought to be spherical in form. Two unexploded bombs picked up after the raid on Yarmouth are conical in shape, the base of one being flat and that of the other rounded. The latest aeroplane equipment provides vertical tubes for carrying the bombs, which are released by pressure on pedals.

TEACHING INDIAN PUPILS TO BE CLEANLY

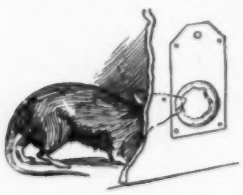
Cleanliness is one of the things upon which particular stress is laid by the instructors in the government's Indian schools. At one of these institutions which is maintained for the benefit of the resident Indians in the Salt River Valley of Arizona, a somewhat curious method is followed in drilling the pupils in the practice of brushing their hair regularly. On one side of the school building there is a long, narrow board bearing a series of numerals, beneath each of which is a peg. Suspended from these are a comb and brush for each of the pupils, and their use is a part of the daily routine.



Combs and Brushes are Provided for All the Pupils at This Government Indian School

POISON BUTTON NAILED OVER RAT HOLE

A new feature in rat poison is a button filled with poison and glued to a tough piece of strawboard. This is nailed over the rat hole in such a way that the rat or mouse is compelled to gnaw through the button and eat the poison in order to get out.



RUSSIAN SOLDIERS WEAR JAPANESE PAPER SHIRTS

Paper shirts made in Japan and now being used in large quantities by the Russian army are said to have proved particularly valuable, because of their warmth, in the winter campaigns in Poland and East Prussia. The paper used is the "hash-ikirazu" paper made from mulberry bark in accordance with a process described in a recent number of this magazine. Paper clothing, known as "kamiko," has long been in use among the Japanese. Such clothing is both cheap and serviceable, its only drawback being that it cannot be washed. The paper is warm and soft, but has little "size" in it, and for this reason a thin layer of silk wadding is placed between two sheets, and the whole is quilted when it is to be used for clothing.

REFRIGERATED CHURCH IN A TEXAS TOWN

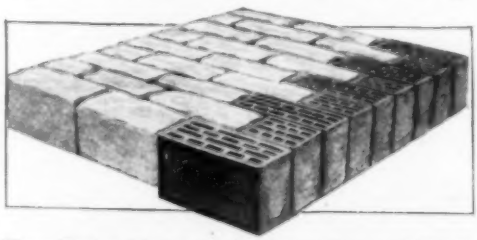
In Orange, Tex., where the summer temperature often reaches an uncomfortable degree, an enterprising religious organization has devised a way of making its church the most comfortable place in town on a hot Sunday. This is done by means of a refrigerating plant, set up in a small building in the rear of the church edifice. The cold-brine pipes are coiled in the church basement, close to a big ventilating fan. Outside air is sucked in by the fan, passing first through a water spray to cleanse it of dust, then through the refrigerating pipes and on up to registers located in various parts of the auditorium. The temperature averages 20° lower than outside. In winter, steam is used in the pipes instead of brine.

PINE TREE WORTH NEARLY ONE HUNDRED DOLLARS

One of the costliest trees on record is a sugar-pine tree cut in trespass from the Stanislaus National Forest in California, for which the government exacted a payment of $99.40. This tree scaled 18,933 ft. board measure, and contained more than enough lumber to build a good-sized suburban frame house, or to build a 2-ft. board walk nearly two miles long. In spite of its high cost the lumber was valued at only $5.25 a thousand feet, which is a lower figure than national-forest lumber is often sold for. This is believed to be the first case on record in which a single tree felled in a national forest was valued at anything like $100 on the stump.

CAST-IRON PAVING BLOCKS FOR BROOKLYN BRIDGE

To provide a roadway that will stand up under the heavy traffic that constantly passes over the narrow roadway of Brooklyn bridge, a new type of paving block consisting of a cast-iron shell, shaped somewhat like a building block and having the openings filled with concrete, has been placed in service. With the best paving material that could be obtained heretofore, ruts have appeared within a few months, necessitating troublesome and expensive repairs. The new blocks have been placed along the edge of the roadway where the rutting



These Paving Blocks, Made of Cast Iron and Filled with Concrete, are being Used on the Roadway of Brooklyn Bridge to Do Away with Wear under the Heavy Team Traffic

was deepest, and although they have been in service for some time, they have not shown indications of wear.

AUTOMATIC ALARM FOR GARAGE ENTRANCE

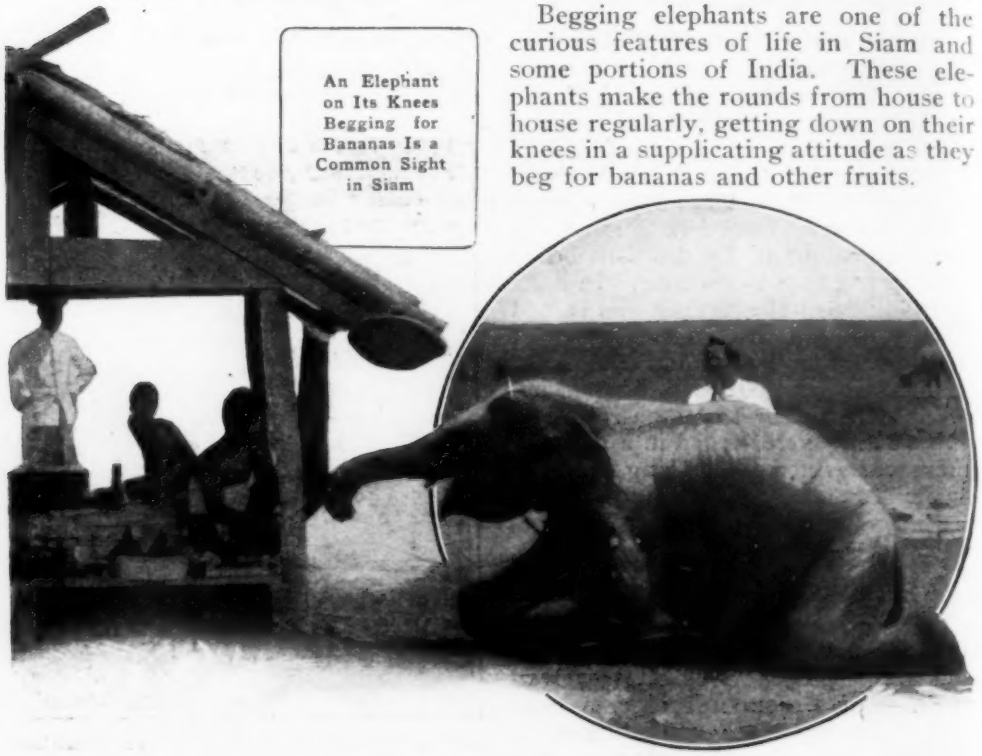
An automatic alarm for the protection of pedestrians passing the door of the garage, which is flush with the

Red Lamp with Automatic Gong Warns Pedestrians When Car is Coming from Garage

inner line of the sidewalk, has been installed by a motor company in Louisville, Ky. The alarm is carried on a bracket that projects out over the sidewalk and consists of a red lamp that is kept burning at all times during the night, with a gong that rings when a car is coming from the garage. The most interesting feature of the apparatus is the automatic device that sounds the alarm. Placed in the floor of the garage in such a position that the two wheels on one side of any car coming from the garage must pass over it is a contact plate that makes and breaks the circuit controlling the gong. This plate is curved upward at the end so that the circuit is open under ordinary conditions, but a car passing over the plate depresses it and makes a contact.

¶ Lord Rosse's telescope, a 6-ft. reflector, for 70 years the largest in the world, has been relegated to a museum.

THE BEGGING ELEPHANTS OF SIAM

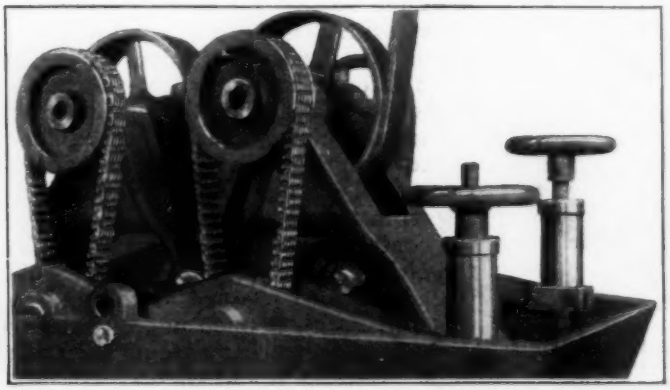


An Elephant on Its Knees Begging for Bananas Is a Common Sight in Siam

Begging elephants are one of the curious features of life in Siam and some portions of India. These elephants make the rounds from house to house regularly, getting down on their knees in a supplicating attitude as they beg for bananas and other fruits.

TESTING DRIVING CHAINS FOR HEAVY MACHINERY

Transmission chains which are to be used for heavy work are tested on a stretching machine which submits them to a greater strain than that which they are expected to meet in actual service. Obviously any weakness or flaw is quickly discovered in this manner, but another function is also performed. By putting them to a high initial tension in this way the slack is taken out of the bearings, which makes an adjustment after a short period of usage unnecessary. In the accompanying photograph the machine is shown in operation. The two chains in the foreground are being stretched, and this is done by adjustment of the screws at the right.



This Machine Removes the Slack from Chain Bearings and Makes a Second Adjustment Unnecessary

INCENDIARY MEDIUMS USED BY GERMANS IN WAR

Reports from correspondents in Europe's theaters of war describe some of the equipment with which the German forces are said to have methodically burned villages in Belgium and on the French frontier, and razed buildings standing in the way of their advance. It is claimed that motor tank cars filled with gasoline under pressure have on several occasions been run through the streets of a town, sprinkling the outsides of the houses, which in turn have been fired by means of hand grenades. It is also asserted that in many regiments there is an incendiary corps equipped with gasoline cans, which are strapped to their bodies. These men enter a house which is to be burned and sprinkle the inflammable liquid through its rooms. An American correspondent of standing, in his cable dispatches, has described the firebrand disks which he asserts are carried by many of the German soldiers in Belgium. These consist of small wads, about the size of five-cent pieces and closely resembling charcoal, which are composed of a nitrocellulose material. They are contained in small bags which, when used, are ignited and thrown through windows of the houses which it is wished to burn. The effect is that each disk burns violently and jumps from one place to another much the same as a firecracker, although the combustion causes no noise, and no trace is left of what caused the fire.

SHIELDING TRAFFIC OFFICER FROM SUN'S RAYS

An ingenious arrangement for protecting a traffic policeman from the sun's rays during the hot days of summer, without at the same time obstructing the street with a large umbrella and supporting tripod which at certain hours is valueless, is employed at Aurora, Ill. It consists of a large square of canvas held by ropes which are fastened to pulleys on poles at the four corners of the street intersection. By letting out or drawing in the various lines the shade may be moved as the sun travels its course.

By Changing the Position of This Canvas Shade as the Sun Moves, a Traffic Policeman may be Afforded a Shady Place to Stand during the Heat of a Summer Day

---

¶The U. S. naval collier "Caesar" was the first ship to proceed direct from Washington, D. C., to San Francisco through the Panama Canal.

FOLDING SHOVEL DESIGNED FOR MOTOR TOURIST

Intended particularly for the use of motor tourists, a folding shovel has been devised which may be easily carried in a tool box, or under the rear seat. The handle does not unjoint, but when unlocked may be folded back so that the whole implement occupies a space of about 12 by 6 by 2 in. It weighs 4 lb. and is substantial enough for all ordinary work. An additional advantage in having such a tool in the repair kit is found when it is necessary to jack up a car in sand or mud, at which time the shovel may be used as a base for the jack.

NEW BRITISH DIRIGIBLE HAS NOVEL FEATURES

A new type of airship recently patented in England, of which several are being built for the British military authorities, according to report, embodies an attempt to combine the advantages of the rigid or Zeppelin type of dirigible with those of the nonrigid type. In this new air craft, the cigar-shaped outer air-tight covering contains a number of gas bags which, when filled with gas, completely fill the envelope, expanding it to its elastic limit and so rendering the whole structure rigid enough to navigate accurately. As the bags become deflated, through leakage or condensation, air is pumped into the outer envelope, thus maintaining the necessary rigidity. The main advantages claimed are simplicity of construction and ease of transportation when deflated.

FRICTION GEARS OF PAPER TRANSMIT HIGH POWERS

Friction transmissions, in which intermeshing toothed gears are replaced by wheels having faces held in rolling contact by spring pressure and transmitting the load from one to the other by surface adhesion alone, are being made in a wide variety of sizes and forms, for many industrial purposes. Very large horsepowers are transmitted in this way in some installations. A recent development is the use of paper-faced cones operating in connection with iron cones to perform the functions of a bevel gear. The wearing qualities of the paper are said to be excellent, and as high as six horsepower per inch of contact width can be transmitted at a speed of 2,000 revolutions per minute.

PHONOGRAPH HORN SERVES AS FLOWERPOT HOLDER

Using a cast-off phonograph horn as a jardinière is the uncommon service a Californian has made of an article which he redeemed from a scrap heap. The framework to support the funnel is made of strips of iron an inch wide, securely fastened together by rivets. The flower shape of the horn makes it quite a novelty as a container for a blooming plant when used either on a porch or lawn.

¶ Waterproof and fireproof paper and noninflammable motion-picture films made from seaweed have been produced by an English inventor.

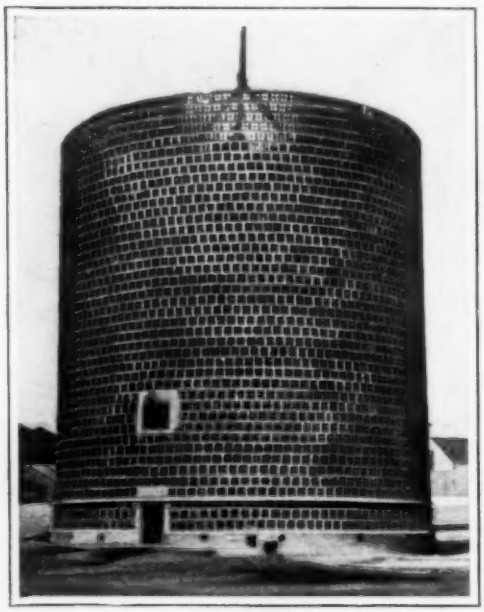
APPARATUS FOR RELEASING GROUNDED SHIPS

A new apparatus for releasing grounded ships makes use of much the same principle as that used by a boatman on a small scale when he poles his boat off a beach. Two tubular steel columns that can be built up in sections to suit any height of ship are placed at the sides of the ship with their bases resting on the sea bottom. The bases of the columns may be spread out like an inverted umbrella for working on soft ground. Chains slung under the hull lead through gears at the top of each column to powerful winches on deck. With the winding up of the chains enough of the weight of the ship can be taken off the bottom to enable the ship to back off or be pulled off by tugs. The apparatus can be taken apart and stored on board the ship.

When the Chain Slung under the Hull is Wound Up by the Winches on Deck, Enough of the Weight of the Ship is Transferred to the Columns to Enable It to Back Off or be Pulled Off by the Tug. The Diagram at the Top Shows How the Column Base can be Spread Out Like an Inverted Umbrella When the Footing Is on Soft Ground

FIREPROOF CRIB IS BUILT OF HOLLOW TILE

Built of hollow tile and concrete, a fireproof corncrib, with a capacity of approximately 1,000 bu., has been constructed at Rudd, Iowa. The foundation and flooring of the structure is made of concrete, while the latter is supplied with drain pipes so that any water that might be driven in during a rainstorm would be drained out before it could work any injury to the grain. As a protection against rats and mice, galvanized iron and fine wire screening is used about the bottom of the structure. The tile is laid horizontally so that its open ends are exposed. This provides a honeycombed wall with perfect ventilation. In the center of the crib is an elevator which is used in hoisting the corn to the top, while passing along a pit at the bottom is a belt conveyor for carrying corn to a sheller on the outside.



Corncrib Made of Hollow Tile

¶An appropriation of $90,000 has been set aside by the state of Massachusetts for the reforestation of the denuded areas of Cape Cod.

METHOD FOR ACID-PROOFING CONCRETE PIPE IS FOUND

Patent rights have recently been awarded in Germany on a process for rendering concrete pipes acid-proof. The method consists of coating the interior of the tubing with asphalt, a thing which has previously been attempted but not with satisfactory results for the reason that the material could not be made to adhere permanently. In the new process a certain quantity of asphalt is mixed with the concrete before the pipe is molded. When the cast has been made and the tube dried, the interior is sand-blasted so that the particles of asphalt imbedded in the concrete are laid bare. When hot asphalt is subsequently coated over the inner wall of the pipe it immediately combines with the asphalt particles in the concrete, which serve to securely anchor it in place. There has been much demand for tubing of this kind in industries in which large quantities of materials containing acids must be conveyed through pipe lines.

SIX-TON MOTOR TRUCK USED IN HANDLING GARBAGE

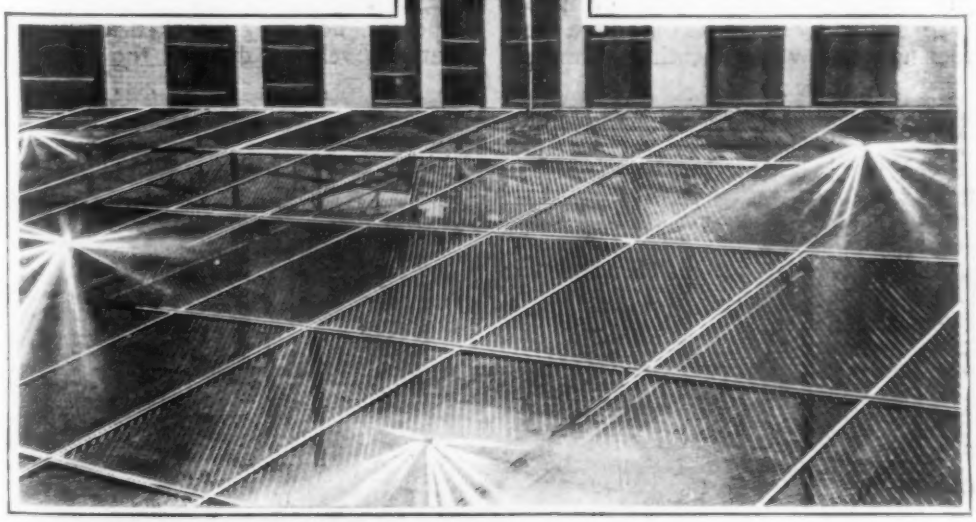
The problem of transporting garbage in a way to suit the peculiar conditions prevailing in that city has been solved in Detroit by the use of a six-ton motor truck working in conjunction with garbage-collection wagons. Owing to the long haul from most sections of the city to the substation where the garbage is loaded on railroad cars for transport to the reduction plant located outside the city, it is impracticable to use horse-drawn wagons for this part of the work. The motor truck could not be used in the house-to-house collection, owing to loss of time caused by the numerous stops. The solution was a combination of the two means of transportation. Each wagon is equipped with a box that holds two tons of garbage and can be lifted off the running gear. The motor truck has a flat deck and is equipped with a 2½-ton crane.

This Garbage Truck is Equipped with a Two and One-Half Ton Crane with Which the Loaded Boxes are Lifted from the Garbage-Collection Wagons to the Deck of the Truck

As the truck traverses the route to the substation it is met by the collection wagons, the loaded boxes are lifted to the deck of the truck, and empty boxes brought back from the substation by the truck are replaced on the wagons.

SPRINKLER SYSTEM FOR COOLING LIGHT COURT

In a high office building in which the glass roof of the central light court is near the third-floor level, a sprinkler system has been installed which keeps the upper side of the skylight wet and not only cools the air on hot days for the tiers of offices above, but prevents the accumulation of dust, which has proved an objectionable feature in the offices facing the court. The water pipes are suspended under the top chords of the steel frame and have vertical risers that project well above the surface of the skylight, and to the tops of these risers sprinkler nozzles are fixed. One riser, located at the center of the skylight, has an ordinary nozzle that shoots the water upward to a height of 50 or 60 ft., and the effect is that of a fountain in the middle of the court. The water flows from the skylight into drains located at the corners of the court. During the summer the water is turned on frequently.



These Sprinklers Keep the Skylight Wet on Hot Days, Washing the Dust into the Drains and Cooling the Air for the Tiers of Offices Above

LARGE GAS-HEATED OVEN FOR BAKING ENAMELS

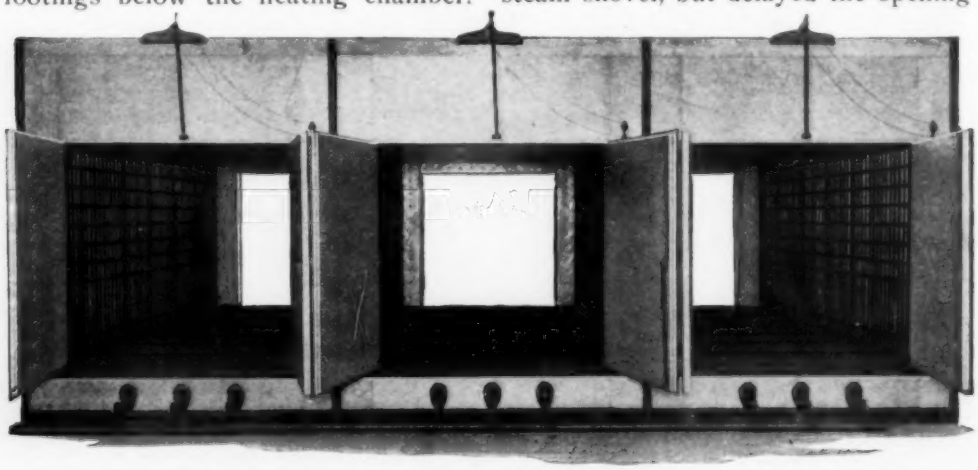
One of the largest gas-heated ovens in the world has just been placed in service at Youngstown, Ohio, for baking the enamel on metal furniture. This oven is 30 ft. long, 16 ft. deep, and 11 ft. 6 in. high, and is divided into three compartments. It is of the radiator type, the chamber containing the gas burners being placed under the floor of the oven and made entirely independent of the baking compartments, so that the gas flame cannot come in contact with the fumes from the enamel as it is baked. The heating chamber, which is built under the entire bottom of the oven, is connected with ducts at the top of the oven by a series of flues that run up the sides of the compartments, and in this way the heat is radiated not only from the floor but from the sides as well. The floor plates are perforated and are supported on castings clear of the heating chamber, so that any material to be baked can be placed on the floor without danger of burning. The three baking compartments can be run independently and at different temperatures if desired, and each is provided with doors at both ends, to facilitate the handling of the material. Support is furnished by uprights that have their footings below the heating chamber. These uprights are hollow and serve to supply the oven with fresh air, which is heated as it passes through the portions of the uprights that are within the heating chamber.

LANOLIN WATERPROOFING FOR FRENCH UNIFORMS

Lanolin, the fat extracted from wool in the process of cleaning it for manufacture, is being used by the French authorities for waterproofing the clothing of their soldiers in the field. The wool fat is reduced to a liquid by the use of a suitable solvent, such as chloroform or carbon bisulphide, and then diluted with a volatile hydrocarbon, like benzine, naphtha, or gasoline. Garments soaked for a short time in this liquid dry quickly when hung in the open, leaving the fibers impregnated with lanolin and almost perfectly non-absorbent of water. Neither the color nor the fabric is impaired by the treatment.

ILL LUCK ACCOMPANIES OPENING OF RAILROAD

A few days before the opening of a new railroad in northwestern California, a slide came down a mountain slope and not only wrecked a $10,000 steam shovel, but delayed the opening



This Gas Oven, Which Is 30 Feet Long, 16 Feet Deep, and 11½ Feet High, is Heated by Radiation through the Floor and from the Flues at the Sides of the Compartments

Cutting Away a Giant Redwood Tree That Fell across a New Railroad in Northwestern California

Upper Right: Steam Shovels Clearing Away the Mass of Loose Rock

Lower Right: What was Left of a $10,000 Steam Shovel After a Slide Came Down a Mountain Slope

of the line for weeks while two steam shovels were busy clearing away the mass of loose rock. Then at a point where the line passes through a redwood forest, about 40 miles south of Eureka, one of the giant trees fell across the track, and traffic was stopped while a section of the tree was being cut away and the track repaired. The force of the fall was so great that it drove the ties and rails into the gravel roadbed over 3 ft. Some idea of the size of this tree is given in the illustration. It is about 100 ft. from the roots to the point where the tree lies across the track, while the upper branches of the tree are beyond the track and outside the limits of the photograph.

NOVEL DEVICE WHICH TRAPS FLIES MECHANICALLY

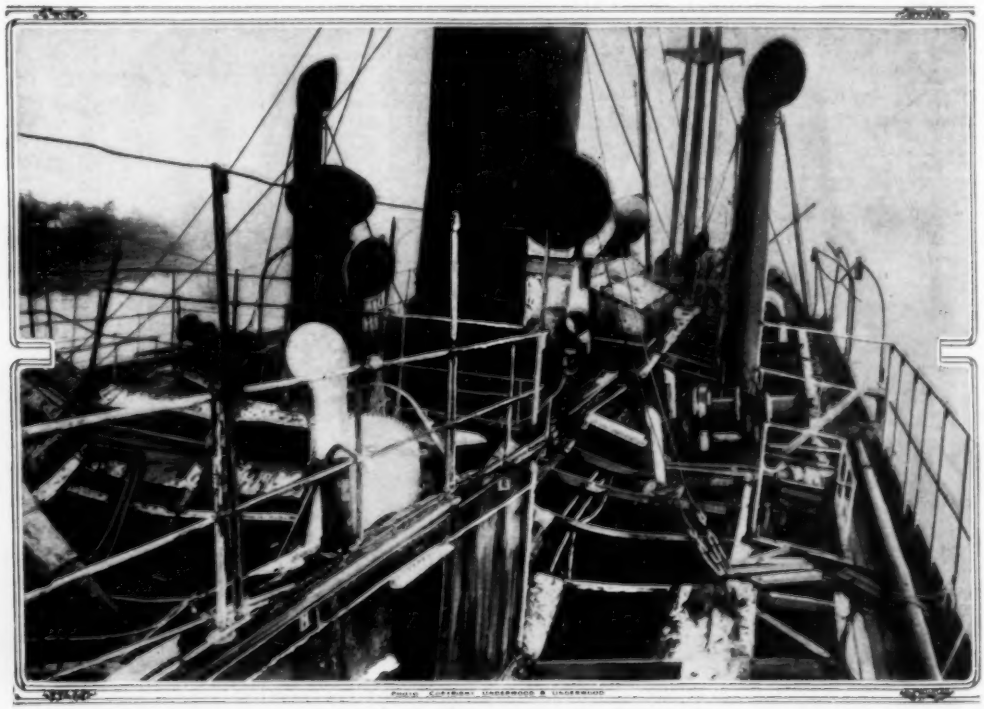
An automatic flytrap has been devised which makes use of the tendency characteristic of this insect to seek light when partly enveloped in darkness. The apparatus consists of a fine-meshed screen globe supported above a revolving bait tray which is mounted above a cylindrical base containing a clockwork mechanism that operates it. Only one-half of the rotating disk, which is provided with a number of depressions in which powdered sugar is placed to attract the flies, is exposed to the light, one side of it being covered. As a fly alights in one of these divisions of the tray it is carried slowly around to the covered side where it is practically in darkness. The only means of immediate exit is through a small aperture which leads to the interior of the wire ball. The fly instinctively travels toward the light admitted through this orifice and enters the trap. One winding of the clockwork operates the trap for 24 hours.

NEW METHODS OF LOCATING AND REMOVING BULLETS

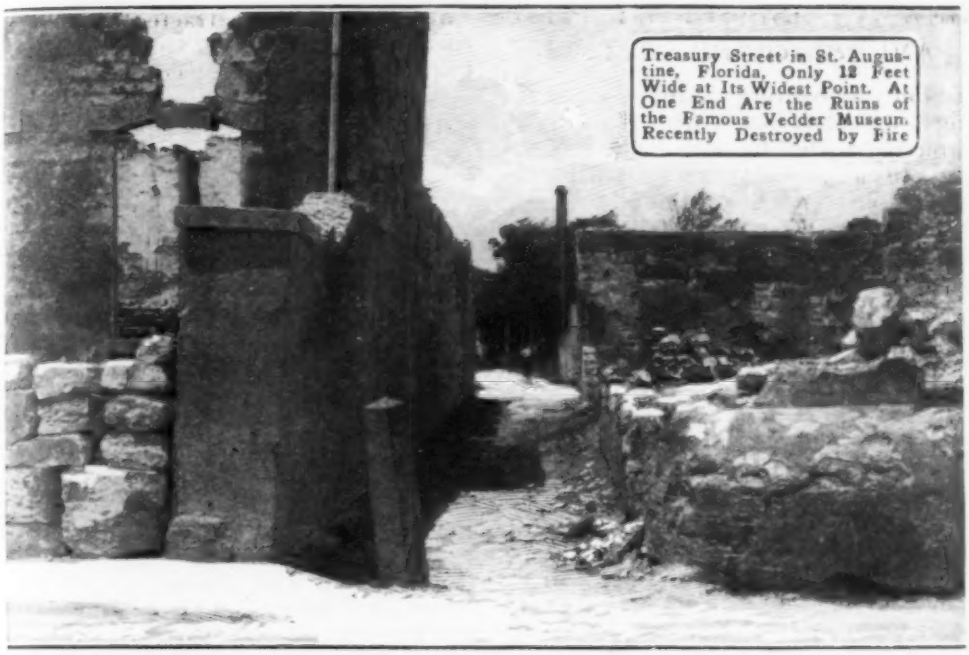
Some interesting methods of locating and extracting bullets have been brought to light in connection with the European war. One of the most ingenious of these is that of locating a bullet with the telephone. In applying this method one terminal is attached to a moistened electrode which is applied to the patient's skin, while the other terminal is attached to the probe, or forceps. When the probe touches the bullet a voltaic cell is formed and a grating sound is heard in the telephone, revealing the exact depth at which the bullet is imbedded in the flesh. A method more commonly used is one in which X-ray photographs are taken. Two photographs are taken from different positions and the intersection of the axes of the two views is sufficient for giving the location of the bullet accurately. In the French field hospitals bullets are being extracted by means of electromagnets, the German bullets with their nickel-steel jackets lending themselves readily to this method of extraction.

HOW A BIG SHIP LOOKS AFTER A FIRE

It is not often there is enough left of a burned ship to photograph, but the accompanying illustration shows how a great steel freighter looks after a disastrous fire. The "Santa Catalina," which was destroyed by flames in the Columbia River, was one of the first ships to carry a cargo from an Atlantic port through the Panama Canal. The freight on board was worth $400,000 and was almost a total loss, while the vessel itself, worth $700,000, was very badly damaged. The "Santa Catalina" was an oil burner, and several thousand barrels of crude oil from the starboard tank added fuel to the flames. All the 42 members of the crew escaped.



How the "Santa Catalina" Looked after a Disastrous Fire



Treasury Street in St. Augustine, Florida, Only 12 Feet Wide at Its Widest Point. At One End Are the Ruins of the Famous Vedder Museum, Recently Destroyed by Fire

IMPORTANT STREET NO WIDER THAN AN ALLEY

What is believed to be the narrowest street in the United States is Treasury Street in St. Augustine, Fla. This street is two and a half blocks long. It is 12 ft. wide at the west end, but narrows at the east end to an alley across which two persons may clasp hands. This thoroughfare is lighted as well as the "regular" streets in the city. Many front doors open on it, and it has its overhanging balconies, high garden walls, and passing crowds. At one end stood the famous Vedder Museum, recently destroyed by fire.

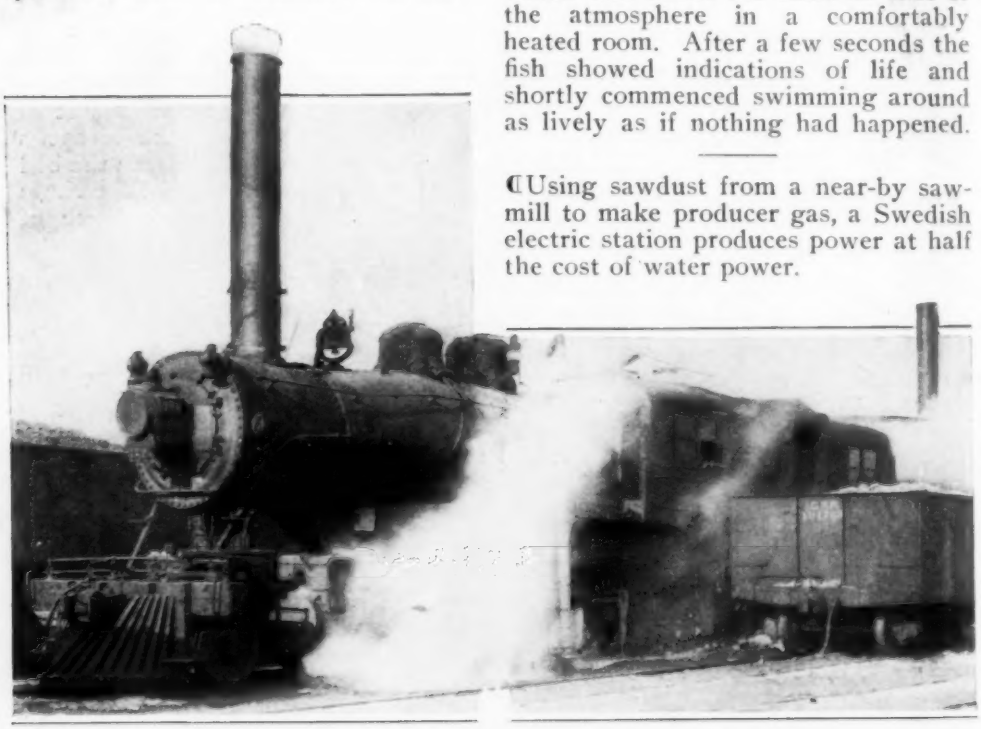
FRESH-AIR CHUTE DESIGNED FOR SLEEPING CHAMBER

For those who are desirous of having the benefit of an open window in their bed chamber without the accompanying cold during winter months, an ingenious air chute has been perfected. It consists of a collapsible pipe which is made by stretching canvas, or some other durable cloth, over a framework composed of wire hoops. One end of this tube is fastened over a circular opening cut in a board which fits between the sash and sill of a raised window, while the other forms a sort of drapery which incloses the sleeper's pillow. A cord extending from the bed to the intake at the mouth of the chute permits control over the volume of air admitted.

Novel Method of Obtaining Fresh Air without Making the Bed Chamber Uncomfortably Cold during Winter Weather

LOCOMOTIVES SUPPLY HEAT FOR PASSENGER STATION

Four locomotives set off on a side-track and connected with the steam main were used by a railroad in Chicago to supply heat for its passenger station and coach yard for a month or more during midwinter, while the boilers in the central heating plant were being replaced. The tenders were first removed, and the locomotives were backed up together in pairs, a space of about 10 ft. being left between the locomotives of each pair. This space was then filled with a platform and shelter for the firemen. Steam was taken from each of the locomotives through a 3-in. pipe, and all four of these pipes were connected with a 6-in. pipe, which led underground to a connection with the permanent steam main. To provide the necessary draft to take the place of that caused by the exhaust from the cylinders when a locomotive is running, the smokestacks of these locomotives were replaced by straight stacks, from 8 to 10 ft. in height.



Locomotive Supplying Steam for Heating Chicago Passenger Station While Regular Heating Plant was being Repaired

GOLDFISH REVIVES RAPIDLY AFTER LIQUID-AIR BATH

Organic matter is made more brittle than glass when it is immersed in liquid air, which is responsible for the fact that if a human hand, for instance, were placed in the fluid and left there for several minutes it would upon withdrawal be so fragile that a comparatively light impact would crush it into small particles. A severe "burn" caused by liquid air frequently requires months for healing. In view of these facts it is interesting to note the result attained during an experiment in which a goldfish was placed in a tumbler filled with the liquid. It was frozen hard immediately upon immersion and was later removed and placed in a glass of water, the temperature of which was about the same as that of the atmosphere in a comfortably heated room. After a few seconds the fish showed indications of life and shortly commenced swimming around as lively as if nothing had happened.

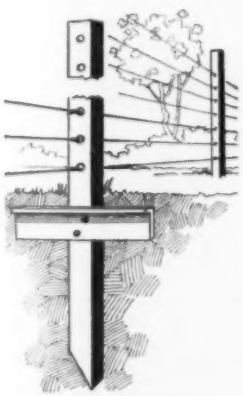
¶Using sawdust from a near-by sawmill to make producer gas, a Swedish electric station produces power at half the cost of water power.

TIME DIFFERENCE BETWEEN WASHINGTON AND PARIS

The first direct observations for determining the difference in time, and therefore in longitude, between Washington, D. C., and Paris, France, were recently completed and give this difference as being 5 hours 17 minutes 36 seconds. Independent observations were made by the United States and French governments, each having two parties, one at the Arlington naval station and the other at the Eiffel tower. The distance between the two points on a great circle was found to be 3,831 miles. One interesting feature of the observations was that of determining the velocity of transmission of wireless signals, which was found to be about 175,000 miles a second.

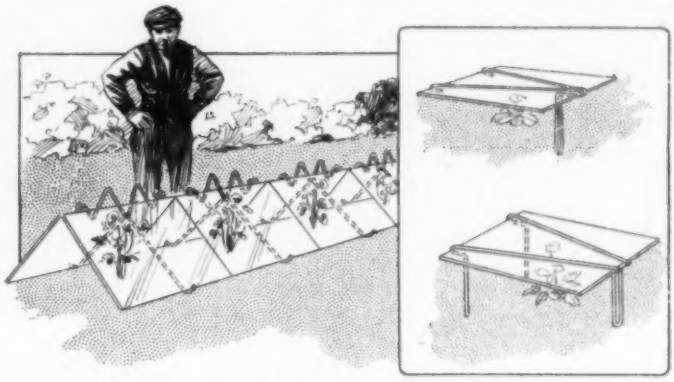
GROUND BAR MAKES STEEL FENCE POST RIGID

Steel fence posts fitted with bar bases, which hold the upright firmly in the earth, are a recent product. An angle head, which allows the post to be driven with an ordinary sledge, saves the time and cost of digging holes and doing the customary tamping. The ground bar has an 8-in. bearing on the soil, and when sunk below the surface, braces the post, which is set 20 in. deep, against side pressure. Any style of fencing may be attached to the posts without difficulty.



COLLAPSIBLE GLASS ROOFING PROTECTS GARDEN PLANTS

Furnishing a shelter for tender plants, protecting them from frost, driving rains, and overexposure during the early weeks of spring, a collapsible glass covering is being made in England. It is so arranged that it may be taken apart readily and stored in a small space when not in use. Each unit is composed of panes of glass, held together firmly like a tent by wire fasteners. These are placed end to end over a row of plants, both protecting them and centering the sun's rays upon them. This enables a garden to be set out much earlier than otherwise would be advisable, and insures an early crop.

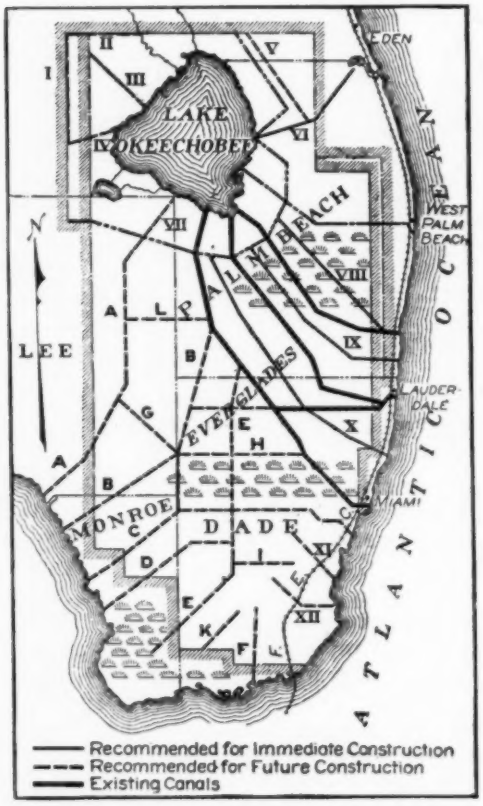


Tent-Shaped Glass Roofing for the Protection of Rows of Young Plants

EVERGLADES RECLAMATION A BIG PROJECT

The Everglades, those famous swamps of Florida, covering thousands of square miles in a state adapted by climate to the production of luscious fruits and early vegetables, have represented for centuries a direct loss. Careful scientific investigations have demonstrated that water flowing over the edge of Lake Okeechobee seeks an outlet through the low-lying lands between the lake and the sea. Control of the overflow, it is asserted by the engineering commission recently appointed to report on condi-

tions there, will eliminate the swamps. Existing canals are to be supplemented by a system which shall divert the water from Lake Okeechobee



Canals Which are Planned to Make Fertile a Great Tract

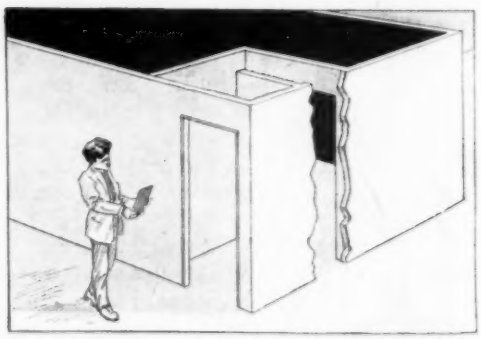
through the shortest practical route to the Atlantic Ocean. Included in the project is a navigable canal, 12 ft. in depth, from St. Lucie to the lake, and the construction and utilization of waterpower of 5,000 hp. The total cost of the project is estimated in excess of $18,000,000.

PROLONGING LIFE OF WOOD IRRIGATION PIPES

Millions of dollars have been expended in the United States during recent years in the construction of wooden pipes for irrigation purposes, and this has led the Department of Agriculture to study the question of how they may best be maintained in order to give the greatest number of years of service. It has been found that conduits made of fir or redwood, if fully exposed to the atmosphere and supported free from contact with soil, will, when properly cared for, last approximately 20 years. Contrary to former beliefs, the life of such a pipe depends upon the wood rather than its metal bands. The growth of fungi and possibly the presence of certain bacteria are principally responsible for decay. Fungi grow only under a favorable combination of air, moisture, and heat; the exclusion of any one of which checks the development. Because of this, pipes which are buried in the ground will be preserved longest by either the maintenance of a high internal pressure which saturates the pores of the wood, or by being packed in very fine soil. When under light pressure and in contact with the earth a wood pipe is most prone to deteriorate, while, on the other hand, if it is entirely exposed to the atmosphere its exterior is generally too dry to be conducive to the growth of fungus spores.

DOORS NOT NEEDED IN DARK ROOMS WITH LIGHT LOCKS

In the construction of laboratories for one of the film companies at Chicago, light locks were devised which eliminate the necessity of employing



The Arrangement of the Light Locks Which Make Doors Unnecessary in Dark-Room Laboratories

either revolving or swinging doors between the dark rooms and those which are illuminated, while at the same time

permitting full ventilation. At all the exits the walls are built so that there is a "U"-shaped recess into which another wall protrudes part way, almost the same as if the standard of the letter "T" were partly inserted in the opening of the letter "U," the cross part of the "T" and one side of the "U" representing the regular building walls, and the other parts, the light lock. The surfaces of the lock walls are painted jet-black, to safeguard against reflection. The arrangement is such that while it is possible for a person to walk through the opening without any difficulty, it is not possible for rays of light to penetrate from one room to the next.

NEW LENSES GIVE CLEAR VISION AT ANY ANGLE

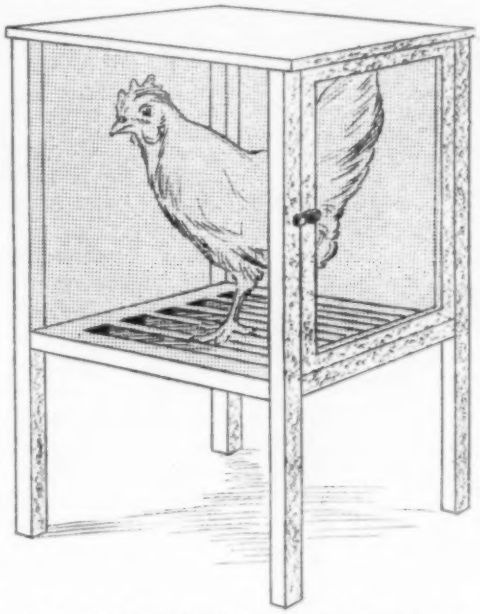
Although developed apparently to the highest point of perfection the best of spectacle lenses heretofore in use have provided the correct refraction only at or near the optical center, or the point directly in front of the pupil

The First Three Columns Show the Distortion Caused at Different Angles by Ordinary Spectacle Lenses, and the Last Three Columns the Effect Produced by Lenses of the New Type

of the eye, and have been subject to a slight distortion when looked through at points near the edge. A new type of lens is designed to do away with this fault and to make the vision as clear through points as much as 30° from the optical center as through the optical center itself. This is accomplished through an exceedingly complex method of grinding the lenses, that necessarily makes them expensive.

DEVICE DISCOURAGES HENS FROM SITTING

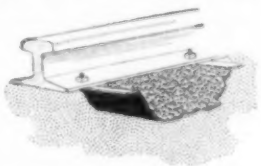
A device which has been used with some degree of success in discouraging hens from sitting, consists of a screened coop provided with a bottom made of narrow slats which are quite widely separated. When placed inside of this, a hen finds standing the most comfortable position it can assume. If it attempts to sit, the position is difficult to maintain, and the sensation of feeling air currents instead of eggs, disconcerting. After having been kept in this box for two or three days a hen usually returns to laying eggs.



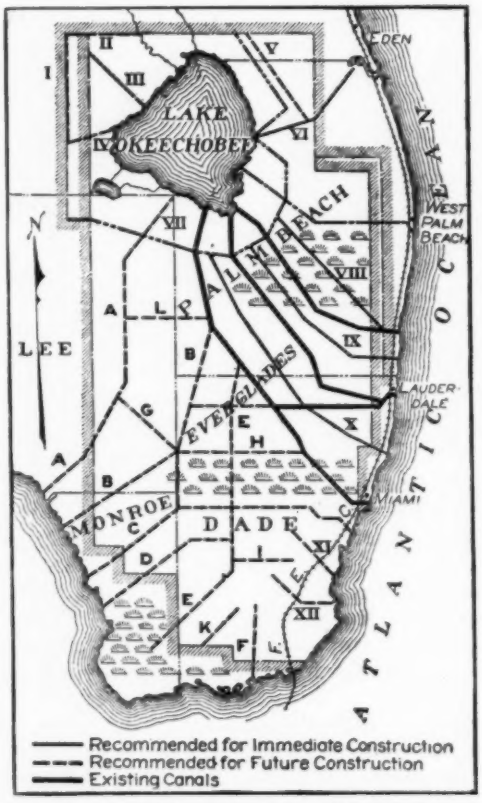
If Placed in This Coop for a Day or Two, a Hen Usually Returns to Egg Laying

STEEL TIE DESIGNED TO BE ELASTIC

A steel railroad tie brought out by a German inventor is an attempt to combine the advantages of metal with the elasticity of the wooden tie. This tie consists of a steel trough having curved sides and bottom, so that while it has a firm bearing in the roadbed it will yield slightly under the weight of a train. It is attached to the rail by bolts passing through the projecting edges, and is filled with earth or gravel.



tions there, will eliminate the swamps. Existing canals are to be supplemented by a system which shall divert the water from Lake Okeechobee



Canals Which are Planned to Make Fertile a Great Tract

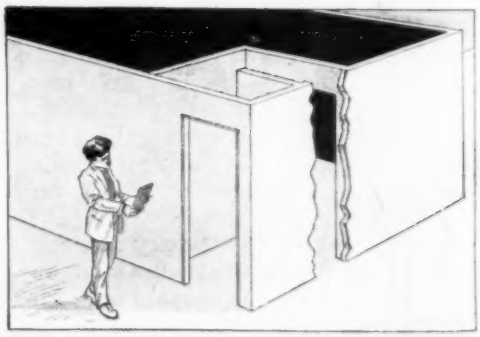
through the shortest practical route to the Atlantic Ocean. Included in the project is a navigable canal, 12 ft. in depth, from St. Lucie to the lake, and the construction and utilization of waterpower of 5,000 hp. The total cost of the project is estimated in excess of $18,000,000.

PROLONGING LIFE OF WOOD IRRIGATION PIPES

Millions of dollars have been expended in the United States during recent years in the construction of wooden pipes for irrigation purposes, and this has led the Department of Agriculture to study the question of how they may best be maintained in order to give the greatest number of years of service. It has been found that conduits made of fir or redwood, if fully exposed to the atmosphere and supported free from contact with soil, will, when properly cared for, last approximately 20 years. Contrary to former beliefs, the life of such a pipe depends upon the wood rather than its metal bands. The growth of fungi and possibly the presence of certain bacteria are principally responsible for decay. Fungi grow only under a favorable combination of air, moisture, and heat; the exclusion of any one of which checks the development. Because of this, pipes which are buried in the ground will be preserved longest by either the maintenance of a high internal pressure which saturates the pores of the wood, or by being packed in very fine soil. When under light pressure and in contact with the earth a wood pipe is most prone to deteriorate, while, on the other hand, if it is entirely exposed to the atmosphere its exterior is generally too dry to be conducive to the growth of fungus spores.

DOORS NOT NEEDED IN DARK ROOMS WITH LIGHT LOCKS

In the construction of laboratories for one of the film companies at Chicago, light locks were devised which eliminate the necessity of employing



The Arrangement of the Light Locks Which Make Doors Unnecessary in Dark-Room Laboratories

either revolving or swinging doors between the dark rooms and those which are illuminated, while at the same time

permitting full ventilation. At all the exits the walls are built so that there is a "U"-shaped recess into which another wall protrudes part way, almost the same as if the standard of the letter "T" were partly inserted in the opening of the letter "U," the cross part of the "T" and one side of the "U" representing the regular building walls, and the other parts, the light lock. The surfaces of the lock walls are painted jet-black, to safeguard against reflection. The arrangement is such that while it is possible for a person to walk through the opening without any difficulty, it is not possible for rays of light to penetrate from one room to the next.

NEW LENSES GIVE CLEAR VISION AT ANY ANGLE

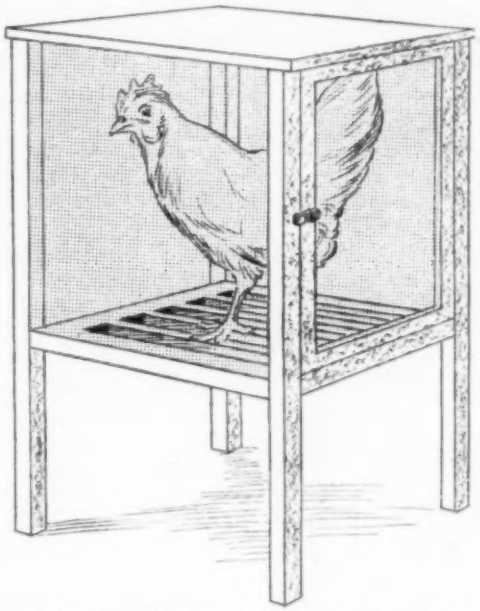
Although developed apparently to the highest point of perfection the best of spectacle lenses heretofore in use have provided the correct refraction only at or near the optical center, or the point directly in front of the pupil

The First Three Columns Show the Distortion Caused at Different Angles by Ordinary Spectacle Lenses, and the Last Three Columns the Effect Produced by Lenses of the New Type

of the eye, and have been subject to a slight distortion when looked through at points near the edge. A new type of lens is designed to do away with this fault and to make the vision as clear through points as much as 30° from the optical center as through the optical center itself. This is accomplished through an exceedingly complex method of grinding the lenses, that necessarily makes them expensive.

DEVICE DISCOURAGES HENS FROM SITTING

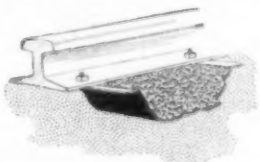
A device which has been used with some degree of success in discouraging hens from sitting, consists of a screened coop provided with a bottom made of narrow slats which are quite widely separated. When placed inside of this, a hen finds standing the most comfortable position it can assume. If it attempts to sit, the position is difficult to maintain, and the sensation of feeling air currents instead of eggs, disconcerting. After having been kept in this box for two or three days a hen usually returns to laying eggs.



If Placed in This Coop for a Day or Two, a Hen Usually Returns to Egg Laying

STEEL TIE DESIGNED TO BE ELASTIC

A steel railroad tie brought out by a German inventor is an attempt to combine the advantages of metal with the elasticity of the wooden tie. This tie consists of a steel trough having curved sides and bottom, so that while it has a firm bearing in the roadbed it will yield slightly under the weight of a train. It is attached to the rail by bolts passing through the projecting edges, and is filled with earth or gravel.



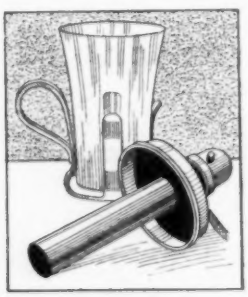
NOVEL AND PRACTICAL THINGS FOR DAILY USE

Convenient Gas-Lighting Device

WORKING automatically and serving for an indefinite period, a gas-igniting device has recently been introduced which eliminates the necessity of using matches when lighting a gas stove or lamp. Inside of a perforated cap, which is at the end of a wooden handle, are several fine wires made of a metal which becomes incandescent when coming in contact with the gas. Because of this property it is only necessary to turn on the gas and place the stick in the flow in order to ignite it.

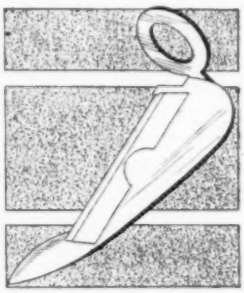
Memorandum Tab Attached to Watch

An ingenious memorandum slip which serves a real purpose for the man who has a tendency to be forgetful, consists of a small piece of celluloid fitted with a clip that may be fastened to the stem of a watch. Notes may be scribbled in pencil on the celluloid and erased at will, while anything written on the tab is sure to be noticed during the day whenever the watch is consulted.



Electrical Water Heater

Designed for warming a small quantity of water or milk quickly, an electric heating device has been invented which may be used in a nursery or sick room. The resistance coil is incased in a cylinder less than an inch in diameter and about 4½ in. long. This is provided with a metal top which serves as a cover for the glass in which the liquid to be heated is contained. It is said to be capable of boiling a glass of water in less than two minutes.

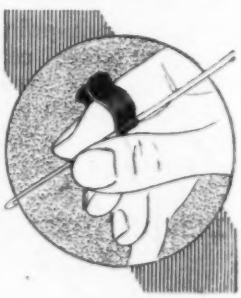


Letter Opener and Paper Cutter

A paper cutter and envelope opener has been designed so that, in opening mail, checks or other inclosures are not so liable to be cut in two accidentally as when an ordinary paper knife is used. It is fitted with a keen cutting edge which may be removed when desired.

Hot-Water-Bottle Dolls

Hot-water-bottle dolls are being made for children who are afraid of the ordinary rubber bags. They hold rubber containers which may be readily filled, making the bodies of the dolls plump, soft, and warm so that they are eagerly accepted as bedfellows. They are made either with indestructible heads, or like rag dolls.

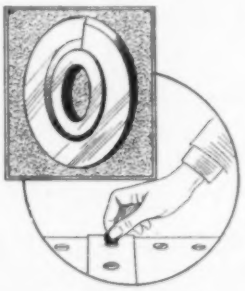


Finger Clamp on Crochet Needle

An adjustable clamp for a crochet needle has been devised which enables

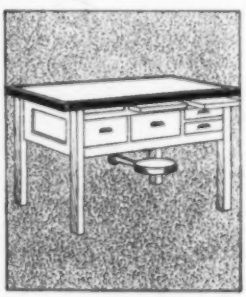
it to be fastened to the first finger so as to relieve the strain of gripping the instrument between the thumb and finger. The device also assists the beginner in learning the correct way to hold a needle, which is not always as easy as it looks.

Intended for emergency purposes, a pocket screwdriver is being made which may be carried as easily as a small coin. The device is about the size of a quarter and is provided with a tapering rim so that it will fit any ordinary-sized screw slot snugly. It is also supplied with a center hole which enables it to be carried on a key ring or hung on a nail.

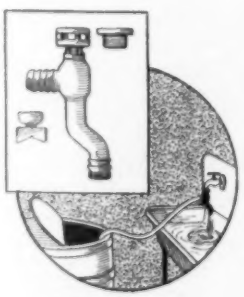


Convenient Pocket Screwdriver

An enamel-topped kitchen table which is easily kept clean and sanitary is a recently introduced household accessory. The top is made of a white, reinforced material that is not only water and acid-proof, but also is resilient enough to eliminate the danger of chipping china by contact with it. It is provided with a seat which may be swung out of the way when not in use.

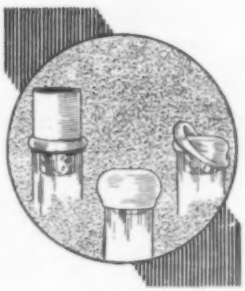


Enamel-Top Kitchen Table



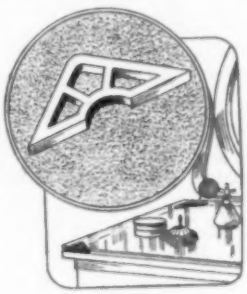
Water-Draining Apparatus

A convenient water-draining device, for use in private laundries and similar places, is designed to transfer water from a washing machine, or other receptacle, into a sink, or wherever it is wished to conduct it. The apparatus is attached to a faucet, and has a hose connected with a side extension and reaching into the container which is to be emptied. By turning on the water a suction is created in the hose, causing the water to discharge itself.



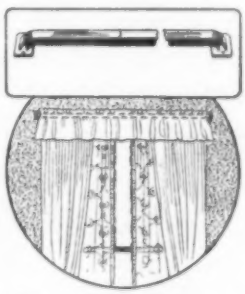
Stopper Seals Flask Hermetically

A bottle stopper which hermetically seals a flask and eliminates the danger of a cork becoming loose, allowing the contents of a receptacle to spill in a bag or suitcase, is designed particularly for the use of travelers. It is fitted with a heavy rubber tube which may be turned down over the lip of a bottle, sealing it air-tight and at the same time holding the cork securely in place.



Rubber Pads for Glass Table Covers

To eliminate the danger of the polished top of a bureau or desk being marred when plate glass is used to cover it, triangular rubber pads are being made which, when placed under the glass at each of its corners, prevent it from slipping.

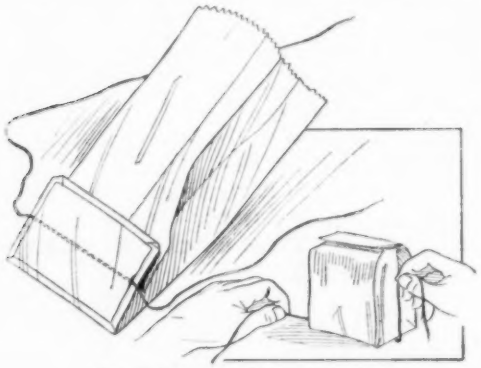


Curtain Rod Which does Not Sag

Flat, telescoping curtain rods are being made which, although light in weight, have sufficient strength to support heavy valances, or over draperies, without sagging.

PAPER SACK HAS STRING ATTACHED READY TO TIE

A paper bag carrying, fastened between its folds, a string with which it may be tied, is a recent novelty de-

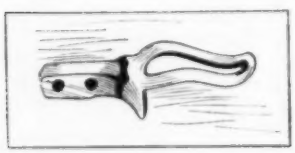


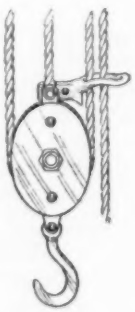
Paper Bag with String Attached

signed to facilitate the wrapping of small packages. Ends of the string extend through channels at both sides of the bottom of the sack. A sufficient length of twine to securely tie the package is contained in a compact space between the folds. When the bag is filled and ready to be wrapped it is only necessary to pull the string about the bag and fasten it.

SAFETY DEVICE TO HOLD SUSPENDED PLATFORM

A large percentage of the accidents that happen to painters and other workmen working on platforms that are sus-



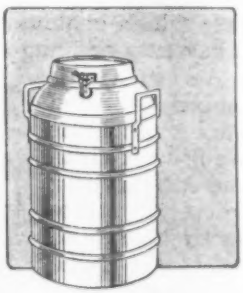


How the Safety Device Works in Case a Workman Loses His Hold on the Fall Rope

pended by block and tackle occur when the fall rope slips from the hands of one of the workers, and to prevent just such accidents as this a simple and apparently effective device has been invented. It consists of a steel loop with a solid end through which the bolt at the top of the block passes, forming a pivoted connection, with the loop end free to swing up or down. The fall rope and the adjacent rope pass through the loop. At the inner end the loop is large enough to permit the ropes to work freely, but tapers to a tight fit at the outer end. In case a workman loses his hold on the fall rope, the friction of the rope causes the loop to fly upward, when the fall rope is forced into the small end of the loop and holds the platform securely.

A REFRIGERATOR MILK CAN KEEPS MILK SWEET

A new way of shipping milk and cream for long distances during the heated season is offered by the invention of a refrigerator milk can which is simply two cans, one within the other, the space between being filled with baked cork and hair felt. In severe tests, under practical road conditions, milk shipped in these cans showed a rise in temperature of but 18° in 24 hours, when exposed to a continuous temperature of 92°. A special form of neck is provided, the inner portion being a segment of a sphere over which the bowl of the cover fits closely, so that the can is perfectly tight, even if the cover be tilted to one side or the other.



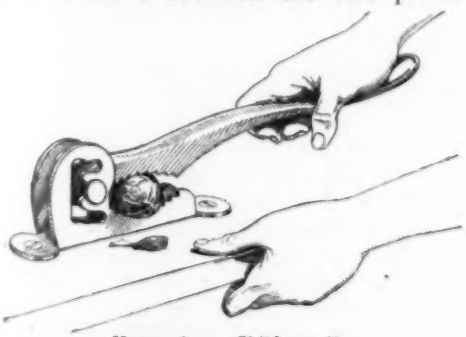
MILITARY FLIERS' SUCCESS HINGES ON AIR MAPS

In extensive operations an airman is almost as seriously hampered if he attempts to navigate the air without aeronautical charts, a compass and a barometer, as a seaman would be were he to try to sail the ocean without nautical maps and various instruments

with which to make observations. This is especially true of the military flier who is penetrating into foreign territory. He must know his position accurately, for a forced landing might mean his undoing. And to the aerial chart is due much of the success of European military airmen. This is mounted on rollers, most often, and so arranged in a frame that an aerial navigator may unwind his chart and thus keep a map of the immediate territory over which he is flying constantly before him. When made for military purposes such a chart includes the positions of fortifications, military camps and whatever information is known of the enemy's district. By landmarks indicated on the map he is able to recognize his position. Attached to the frame usually are his compass, barometer and clock, although these oftentimes are provided for in some other manner.

GRIP STRENGTH NOT NEEDED TO WORK NEW NUTCRACKER

A new type of nutcracker is worked by placing pressure upon a single lever, instead of gripping two bars as in the case of the ordinary implement. The construction is simple, the device consisting of one lever pivoted into a shorter toothed bar which forms the lower part of the cracker. When in use the instrument is placed on a table, the nut inserted between the two pieces

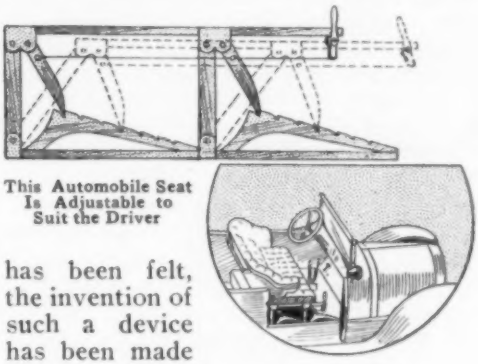


Nutcracker a Child can Use

and pressure exerted upon the lever. In this manner it may be worked with rapidity by a child.

ADJUSTABLE SEAT FOR MOTOR CHAUFFEUR

While the necessity of an adjustable automobile seat suited for quick adaptation to different drivers long has been felt, the invention of such a device has been made only recently by an Australian. In the case of an ordinary fixed seat, the reach to the clutch and brakes may be comfortable for one chauffeur and exceedingly awkward for another. To overcome this trouble, a frame has been made which may be adjusted speedily to any desired position by moving the seat downward and forward, or upward and backward. This function of the arrangement is made possible by the operation of a single lever. To do this, a series of ratchet bars are employed which are fastened to the seat by link rods. Pivoted to these are locking members which engage and disengage the ratchets.



This Automobile Seat Is Adjustable to Suit the Driver

NEW PROCESS CHEAPENS RADIUM COST

Radium bromide valued at $11,000, recently turned over to the National Radium Institute for the treatment of cancer cases, is the first radium extracted by the new process developed by the experts of the Bureau of Mines. The work of extracting the metal was done in the laboratory of the bureau at Denver, from Colorado ores. The cost was only $40,000 a gram (15.43 grains), while the commercial price of radium is about $120,000 a gram.

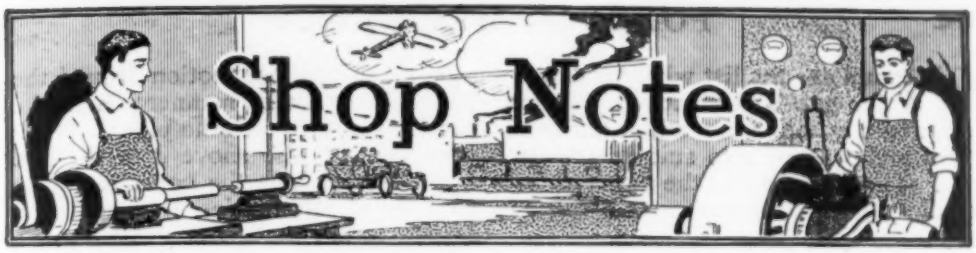
NEW UNITED STATES COAST GUARD ESTABLISHED

The establishment of the United States Coast Guard, provided for in a recent act of Congress that has been approved by the President, brings about an amalgamation of the revenue-cutter and life-saving services that is expected to result not only in an improvement in the work of these two services but in the provision of an invaluable means of coast patrol and defense in time of war. The coast guard is to have its land and sea forces enrolled like soldiers and sailors, under like discipline, and with parallel emoluments for service and rewards for distinguished deeds, but organized primarily for the saving of human life and property.

At the discretion of the President, the entire service may be transferred to the Navy Department, and will constitute a naval reserve composed of highly trained officers and men thoroughly familiar with the coast and ready at a moment's notice to operate under the Navy Department. In time of war the life-saving branch, now designated as the shore division of the new service, would serve as a beach patrol to give warning of the approach of hostile vessels. The life-saving stations would be used for observation and signaling, while the revenue-cutter branch, now designated as the marine division, would be utilized for scouting and similar duties. The plan of using the life-savers as a coast patrol in time of war is not a new one, and was resorted to during the Spanish-American War. The amalgamation of the two services has created an establishment composed of 4,100 officers and men, 25 ships of the seagoing type, 19 harbor tugs and launches, and 279 coast-guard stations.

Under the regulations, the disadvantages that have heretofore operated to make the life-saving and revenue-cutter services unattractive to ambitious young men have been removed. Provision is made for placing the men on the retired list for age, or after 30 years of service, as is done in the army and navy; for increased pay for reënlistment; for clothing allowances; for medical attention from the United States Public Health Service, and for a sum of money equivalent to two years' pay to the dependents of men who lose their lives in the service. With all the benefits that are expected to accrue from work of the coast guard, it will, in fact, cost the country nothing, as the saving of life and property will at all times be worth more to the people than the cost of maintaining the service. Records of the two services, for the year ended June 30, 1914, show that for each dollar expended there was a saving of $5.09 worth of property from the perils of the sea. In addition to this, 5,238 lives were saved and 31 derelicts, or obstructions to navigation, were removed or destroyed, during this period, while assistance was rendered to 2,147 vessels having an aggregate value, including cargo, of $24,386,191. There will be an increase in the cost of operating the service, however, due to the retirement of officers and men and reënlistment and disability increases, all estimated at $400,000 for the first year, and the payments made to dependents of men who lose their lives in the service, estimated at $20,000 a year. One of the men to be placed on the retired list at three-quarters pay is Sumner I. Kimball, now 80 years of age, who founded the life-saving service and was its superintendent for many years, and who devoted the best years of his life to its upbuilding. While the work of the coast guard will be confined mainly to the Atlantic, Pacific, and Gulf coasts and to the Great Lakes, the service will be held in readiness to give prompt assistance when lives and property are threatened by floods along the rivers of the country.

¶ In one day 15 forest fires in California were started by a single wood-burning locomotive.

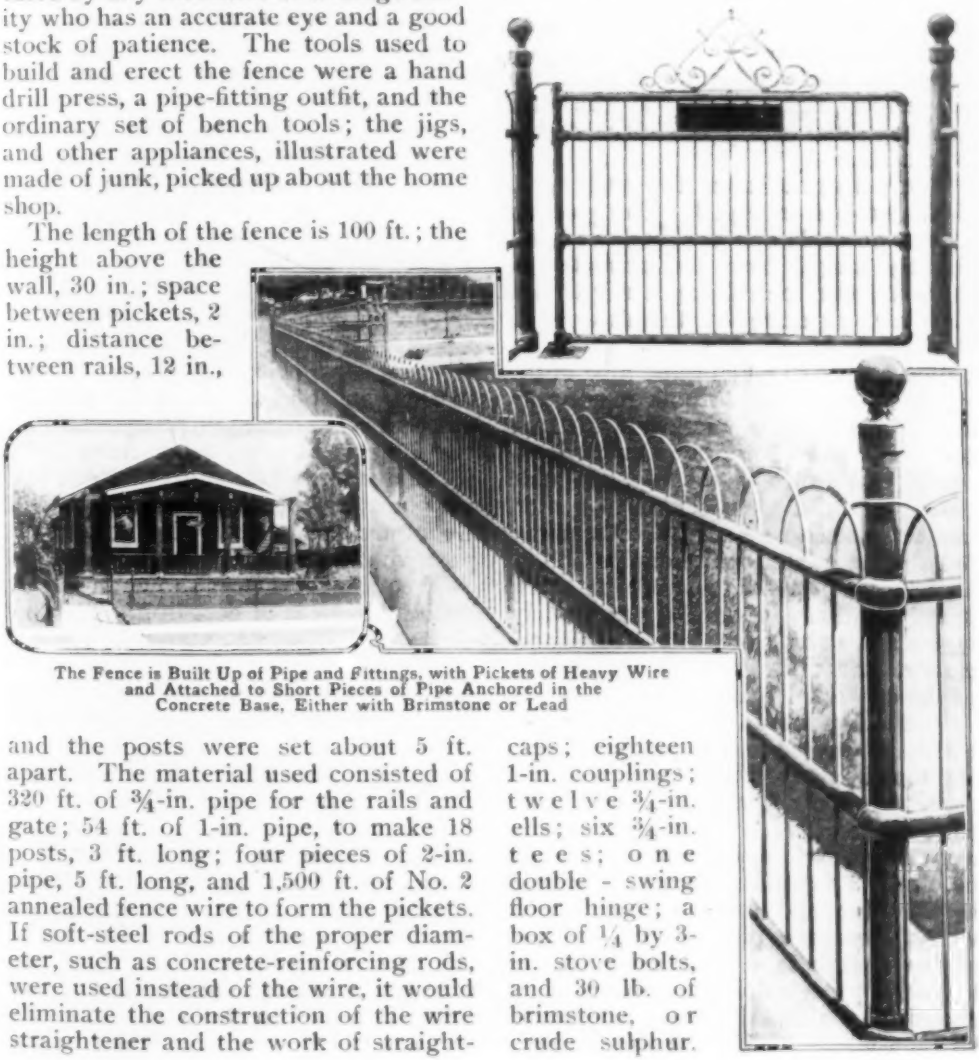


A Homemade Metal Fence

By T. T. STURGEON

THE metal fence shown was constructed by myself, who am only an amateur mechanic, and can be duplicated by any mechanic of average ability who has an accurate eye and a good stock of patience. The tools used to build and erect the fence were a hand drill press, a pipe-fitting outfit, and the ordinary set of bench tools; the jigs, and other appliances, illustrated were made of junk, picked up about the home shop.

The length of the fence is 100 ft.; the height above the wall, 30 in.; space between pickets, 2 in.; distance between rails, 12 in., and the posts were set about 5 ft. apart. The material used consisted of 320 ft. of ¾-in. pipe for the rails and gate; 54 ft. of 1-in. pipe, to make 18 posts, 3 ft. long; four pieces of 2-in. pipe, 5 ft. long, and 1,500 ft. of No. 2 annealed fence wire to form the pickets. If soft-steel rods of the proper diameter, such as concrete-reinforcing rods, were used instead of the wire, it would eliminate the construction of the wire straightener and the work of straightening the large number of pickets. The smaller things required are four 2-in. ball ornaments; eighteen 1-in. pipe caps; eighteen 1-in. couplings; twelve ¾-in. ells; six ¾-in. tees; one double-swing floor hinge; a box of ¼ by 3-in. stove bolts, and 30 lb. of brimstone, or crude sulphur.



The Fence is Built Up of Pipe and Fittings, with Pickets of Heavy Wire and Attached to Short Pieces of Pipe Anchored in the Concrete Base, Either with Brimstone or Lead

This completes the list with the exception of the gate ornament, which once adorned a gasoline stove in a different form and was bent to suit its present use. The total cost of the material, including that of the 14-in. wall, was 51 cents per lineal foot.

The first operation in constructing the fence is to build the drill bench, and on it and the drill jig depends the accuracy of the large number of holes to be drilled. The table of the press is swung out of the way and a perfectly straight plank—one without a twist in it is absolutely necessary—12 in. wide, 2 in. thick, and 12 ft. long, is placed at the proper height with the drill about 2 ft. from its right end. The plank is adjusted so that its surface is level and at perfect right angles to the drill spindle, thus taking the place of the drill table.

The construction of the drill jig is clearly shown in Fig. 1. The grooved blocks at each end are hollowed out slightly larger than the diameter of the pipe, thus permitting a slight side play for centering by the screws, as shown at A. The spring clamp is pulled out when placing the pipe in the jig and snaps back to hold it securely against the centering screws, which are ordinary setscrews secured with locknuts. The holes in the top, or guide plate, are 2 in. from center to center, and are used to make the pattern rail only. The guide for the drill is half of a motor-car chain and is fastened loosely to the plate so that the jig may be set at an angle with the drill, if necessary, and still guide the drill true to the center without binding.

In drilling the pattern rail the outer end is supported at the proper height, the pipe is entered in the jig from left to right, and the first hole is drilled 1 in. from the end; then the pipe is shifted until the pin will slip through the guide hole in the top plate, through the hole in the pipe and into the base plate, which locks the pipe for the drilling of the next hole, and so on until the length of pipe is drilled, which will be about 125 holes. Extreme care must be used when drilling the pattern rail, to take up the lost motion around the pin in the following manner: After the pin is in place, twist the pipe from the operator and also shove it to the left. For the next hole the opposite course is pursued, alternating for each hole. If this is not done, the variation of a small fraction of an inch on the same side of all holes will bring the last hole out of true ½ in. or more.

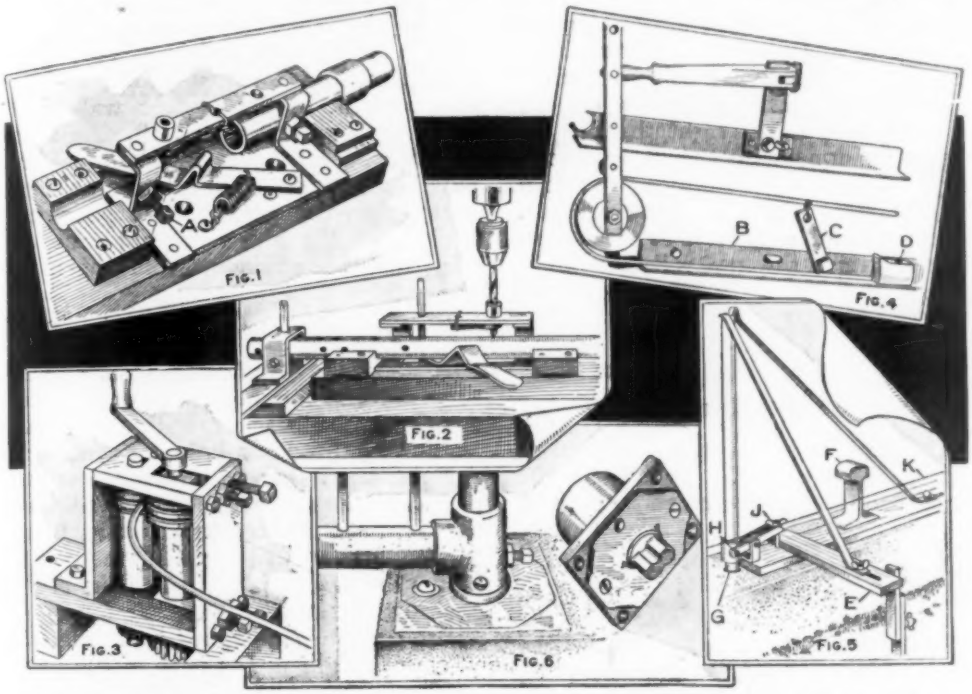
After the pattern rail is drilled, it is clamped on top of the next pipe, and a center punch of a size to snugly fit the drilled holes, in this case $\frac{9}{32}$ in. in diameter, is used to mark the next pipe. The operation of drilling the second pipe is the same as for drilling the pattern, except that the sliding jig is used to keep the pipe from turning under the drill, and the punch marks are used for a guide to start the drill. All the pipes are drilled in the same manner, except those intended for the bottom rails, which are drilled through the top only, except where necessary to put the sliding-jig pin through. The drilling operation is shown in Fig. 2.

The wire-straightening apparatus is shown in Fig. 3. There are many different forms of straighteners on the market, and one can be easily worked out that will answer the purpose. The one illustrated consists of three rolls, set in a frame of metal so that one roll may be adjusted against the other two. Gears are used on the rolls to make a positive movement.

The picket former is shown in Fig. 4. A circular piece of cast iron, 5½ in. in diameter, forms a mandrel around which the pickets are bent. The bending lever consists of a piece of strap iron, 1½ in. wide and ½ in. thick, with a sash-weight pulley wheel bolted to it, so that it will clear the mandrel just enough to permit the picket wire to pass in between them. The guide and clamp to hold the wire is made of a piece of angle iron, B, and a short piece of strap iron, C, 1 in. wide and ½ in. thick, with a notch filed in the lower end in such a manner that, when the wire end is against the stop D and the clamp is pulled to the left, it locks itself, and the wire is held tightly to the

angle iron. The wire is placed in the bender with the bending lever in the downward position. To form the picket, swing the lever to the vertical.

the jig shown in Fig. 5 was used to simplify the operation. The jig is placed on the wall with the clamp directly over the post hole, and the brace



The Jig That Takes the Place of the Drill-Press Table for Drilling the Holes Accurately in the Rails, the Wire-Straightening Machine, the Picket Former, the Post Setter, and the Gate Hinge

As the fence is to be set over a concrete wall, the posts must be prepared in such a manner that the fence can be dismantled at any time by making the posts in two pieces, one 25 in. long and the other 11 in. The short lengths of pipe are set in the concrete base so that the upper end extends above the surface just enough to fit on a coupling. The upper part of the post is screwed into the coupling. The bottom rail is bolted to the coupling, which just clears the surface of the wall; the other holes for the rails are 12 in. apart, thus leaving just enough end to screw a cap on top when the upper rail is in place.

In erecting this fence, the same procedure is followed out as in building a wood fence. When the wall is built, holes about ½ in. larger than the posts are left at the exact location where the posts are to be set. In setting the posts E, at the end of the side arm, is adjusted with the ground to hold the arm solid. A weight, F, is placed on the jig to hold it steady. The post G is then dropped into the hole and adjusted in the clamp H, by placing a pin through a hole in the coupling. The post is then raised or lowered by means of the wing nut J in the clamp, until some certain point marked on the coupling is in line with the guide line K. The top braces are then adjusted, and the post plumbed by sliding the lower end of the braces, the bolts holding them sliding in slots, until plumb, then clamped with the thumbscrews. The brimstone is melted and poured in the hole around the post and allowed to cool.

After the posts are all set, the rails are coupled together on the straight run with couplings, and on the corners with ells. They are then clamped to

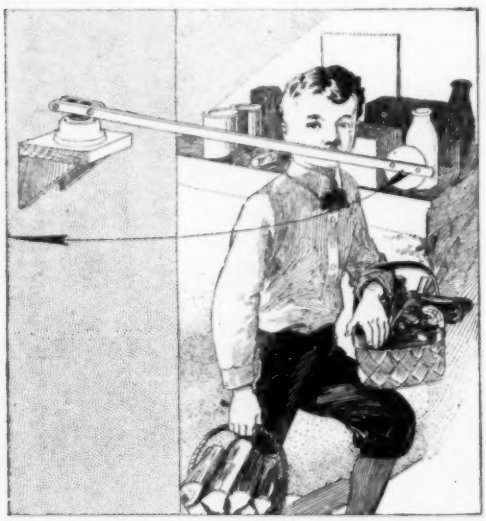
the posts in their respective positions and drilled for stove bolts by means of a breast drill. The pickets are then driven in and the fence is complete, all but the gate.

The gate is the most difficult part to construct, and the illustration shows better than words can tell its form of construction. The threading of the pipes should be all right threads and has to be done with the utmost accuracy. The two middle rails are run in on one side, and then back into the other side and calked. The pickets are then set, and the top rail put on by means of a run-back of each of the short nipples on each side. The top bearing is simply a pipe plug screwed into the top tee, the square part being filed round to fit the hole in the supporting bracket.

The hinge used to hang the gate is shown in Fig. 6. This hinge is the type used for double-swing doors, and is countersunk in the cement walk and filled with a very heavy oil. As it is ball-bearing, the gate is absolutely silent in its action. There is no need of a latch on the gate, as the powerful springs of the hinge prevent any of the smaller animals from opening the gate.

Switch Arm for Use on Basement-Light Circuit

Although it is the usual custom to put a basement-light switch at the head of the steps for convenience, there



Long Arm Placed on an Electric Switch to Strike the Person Leaving the Basement Steps

is a serious drawback to this position. In a certain basement storeroom it became an annoyingly frequent occurrence to find the light burning hours after the person using it had left, for it was an easy matter to go out into the daylight and forget to turn the switch.

In order to avoid this waste of light, the device shown in the illustration was adopted. First, the switch was removed and mounted horizontally on a small wood bracket, with the wires leading up through a hole in the center. A light wood arm, 15 in. long, was attached to the switch, as shown, so that the light would be turned off as long as the arm rested against the wall. When the switch is turned to the "on" position, the projecting arm forms a positive means of turning out the light, since it is right in the path of the person leaving the stairs. The card disk at the end makes it easily seen.—Contributed by Morris G. Miller, New Rochelle, New York.

A Protection for the Acid Bottle

The bottle used as a container for nitric acid, that is kept in a shop for etching steel, is often struck with some piece of metal and broken. As this is a dangerous acid when not confined, it is well to be careful and use all caution possible in handling the liquid. A good safeguard is to glue a cardboard disk to the bottom of the bottle, then coat the outside surface with glue, and when it becomes tacky, roll it in small particles of cork. The cork may be obtained from a fruit dealer selling imported grapes. When the glue hardens to hold the cork, it makes a very satisfactory guard against breakage. Owing to its touch, the bottle can also be used as a poison bottle for the home.

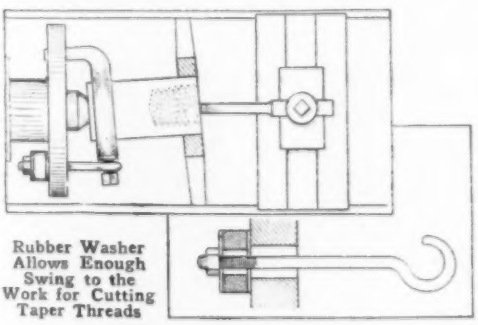
Mucilage Used to Stop Leak in Gasoline Connection

A leak started in the ground-joint connection between the gasoline-supply pipe and the carburetor on my automobile. It was in a place where it could not be reground easily, although I tried to stop it in this manner. Soap and other lubricants were used to no avail. The thought came to me that some liquid which gasoline would not cut might do, and I used a small portion of old mucilage which had become thick, applying it to the connection and letting it stand to harden, then screwing the joint together. This stopped the leak.—Contributed by Bert H. Stanley, Portage, Wash.

Holding Work in Lathe to Cut Taper Threads

In cutting an inside taper thread on a lathe, I have found the device illustrated an excellent substitute for a yoke that rocks on the lathe dog.

The device, which is only intended for light work, consists of a bolt, threaded for a nut on one end, and formed to a hook on the other, to engage the setscrew of a lathe dog. The bolt is amply long to receive a rubber washer, between two metal washers, on the threaded end. The rubber washer is made by cutting a 1-in.

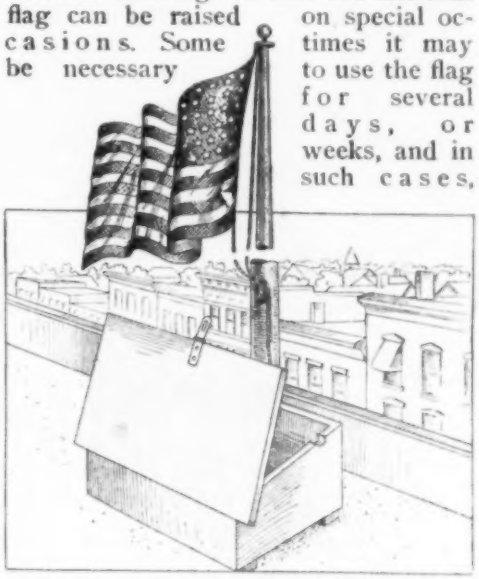


Rubber Washer Allows Enough Swing to the Work for Cutting Taper Threads

length from a discarded clothes-wringer roll. The application is clearly shown in the sketch.—Contributed by L. Nash, Chesley, Ont.

Housing for a Large Flag

Many business firms have a flagpole on their buildings so that the national flag can be raised on special occasions. Sometimes it may be necessary to use the flag for several days, or weeks, and in such cases,



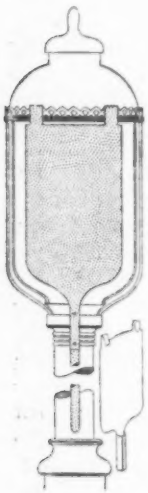
The Box Protects the Flag at Night, without the Need of Taking It from Its Halyards

the flag will be exposed to the weather at night unless it is taken from its halyards and put up again in the morning. One merchant, desiring to protect his flag and keep it as clean as possible, made a box on the roof, as shown in the illustration, to house it when not in use.

The box was made about 18 in. deep, 2 ft. wide, and 3 ft. long, which was large enough to hold two flags of the size used for such purposes. The box was placed on two timbers on the roof at the base of the flagpole. The cover was made slanting, with its edges projecting over on all edges. A notch was cut in the upper edge of one end to admit the halyards when the flag was placed in the box. This made it very easy to haul down the flag and store it for the night. A hasp is provided to lock the flag in with a padlock, and in this case the box was protected from view of the street by a balustrade on top of the building front.—Contributed by John Kohlbecher, San Francisco, California.

Street-Lamp Glare Shield

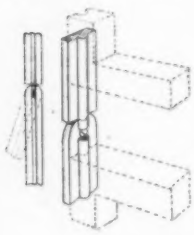
Any fixed form of light deflector for a street lamp was strictly forbidden in our city, and the one in front of our house caused considerable annoyance by its glare when we were sitting on the porch in the evening. The light on the porch, during the time it was burning, made an excellent burglar protection.



To overcome all difficulties I designed the deflector shown in the sketch, which can be easily placed on and taken off a lamp, and has given perfect satisfaction. It is in the shape of a shovel, the blade being made of galvanized iron and the handle constructed from an old broom handle. The position of the hooks by which it is hung, the manner of shaping the sheet metal, and the way in which it is placed on a lamp, are all plainly shown.—Contributed by Irving M. Hayward, Brooklyn, N. Y.

Hinged Molding for Window Screen

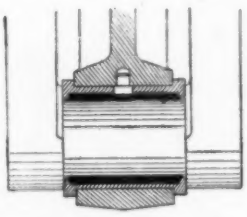
Window screens held in place by special molding strips can be easily removed for cleaning or other purposes, if arranged as shown in the illustration. In order to do this, the molding on both sides of the window should be sawed in two, so the lower piece will be a little longer than the height of the screen. If the molding is already fastened in place, the lower pieces should be removed so their upper edges may be rounded off to permit the molding to swing either out or in, as desired, when pinned near its upper edge, as shown. Holes should be drilled and countersunk for loosely fitting wood screws, which are used as hinge pins, and are fastened in place by being screwed into the window jambs. To lock the hinged strips in their regular upright position, a hole should be drilled near the bottom edge, and continued into the window jamb, to fit a wire nail, or bolt.



In using this arrangement both hinged strips, after being secured at their upper ends, are swung out, and the screen is slipped in place; it can then be swung to its regular upright position. To fasten it in place, the nails, or bolts, are inserted in the lower holes. In order to take out the screen, the molding must first be unlocked by the removal of the nails. The screen can then be swung away from the window and removed.—Contributed by M. Baudier, New Orleans, La.

Doweling Loose Bearings

In order to stop the turning of loose bearings in connecting rods, a simple method would be to provide the rod with a tightly fitting dowel pin, projecting sufficiently far to enter a corresponding hole drilled in the bearing. Care should be taken that the top of the dowel is always below the surface of the bearing metal.



Cover for an Automobile Starting-Crank Handle

An extremely handy addition to the starting crank of an automobile in winter is a piece of rubber hose placed over the handle. The usual type of crank is fitted with a metal sleeve of either brass, copper, or steel, and in winter the sleeve becomes more or less slippery, due to the ice and snow, resulting in making it very difficult to crank. The addition of the rubber sleeve over the metal one readily eliminates the trouble.

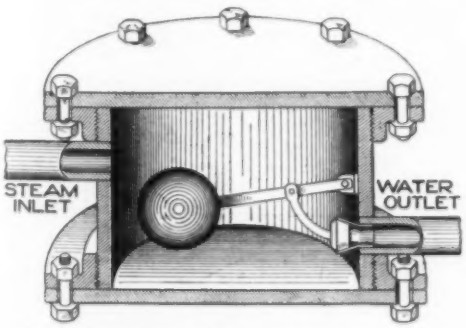
Removing Tar and Asphalt Spots

Do not use soap on tar or asphalt spots in cloth first, as this will set it in a way to make the cleaning almost impossible. Rub the spots with soft grease, and set aside until the grease penetrates the tar. Remove the tar and grease with gasoline, or by washing in hot suds. Asphalt should be well wetted with kerosene and left to stand, then washed out in turpentine or alcohol.

Easily Made Steam Trap

An inexpensive steam trap can be constructed from a piece of 8-in. pipe, 6 or 8 in. long, two flanged heads, and a float. The pipe is threaded for the flanges, which are to hold the heads after they are prepared. One side of the pipe is drilled near one edge, to receive a pipe from the lowest part of the steam system. The other side is fitted with a ball float and lever, hinged near its center. The float lever is fitted with an arm shaped properly to carry a tapered valve on that end which enters the outlet pipe.

The action of the trap is as follows: The water from the condensation in the steam system falls to the lowest part and enters the trap. When the level has risen sufficiently to lift the ball float, the valve is opened and the

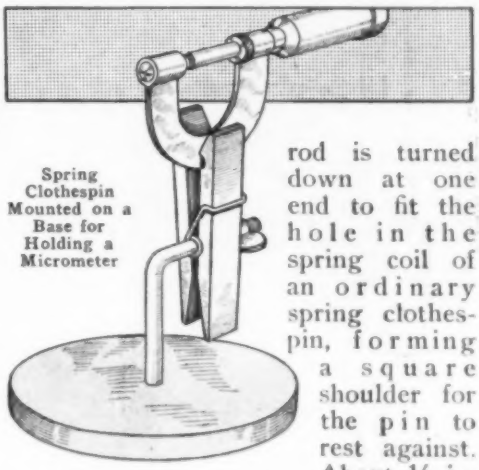


Steam Trap Made of a Large Pipe with a Float to Operate the Outlet Valve

steam pressure forces the water out. The lowering of the water in the trap allows the ball float to close the opening.

Micrometer Holder

A holder for a micrometer, which fully answers the purpose of an expensive one, is made as follows: A ¼-in.



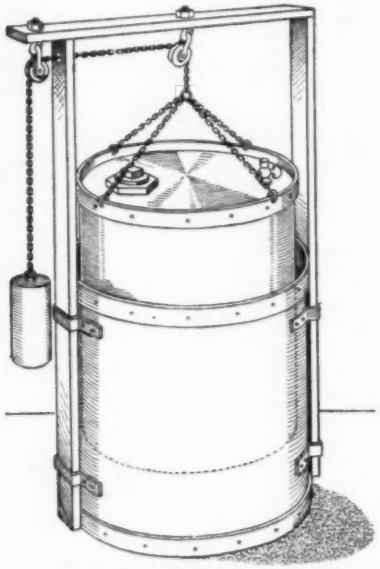
Spring Clothespin Mounted on a Base for Holding a Micrometer

rod is turned down at one end to fit the hole in the spring coil of an ordinary spring clothespin, forming a square shoulder for the pin to rest against. About ½ in. back from the shoulder the rod is bent at right angles, and the end is fastened in a metal base of sufficient weight to hold the micrometer rigidly. The length of the rod is optional. The end of the portion turned down is threaded and fitted with a wing nut. The manner of using the holder, with the clothespin as a vise, is clearly shown.

Tanks for Supplying Air at Low Pressures

In soldering metals, or melting them in small amounts, compressed air at low pressures can be used to great advantage in connection with gas burners. Power blowers are ordinarily used to obtain the necessary pressure, but a good, cheap substitute for small work can be made of two heavy cans, as shown in the illustration. Two sizes of cans should be obtained, so one may freely pass within the other. They should be open at one end, but otherwise air and watertight. The larger, or stationary, tank should be provided with four strips of metal placed in sets of two on directly opposite sides and fastened with rivets, or solder. The strips of

metal are formed to fit two wooden strips used as uprights for a frame which is connected at the top by a



A Low-Pressure Air Tank to Supply Air in Burners for Working Metals Having a Low Melting Temperature

crosspiece provided with two pulleys, one midway between the uprights, and the other suspended from an extension on one side. The upright on this side is drilled for a cable hole in line with the tops of the pulley wheels.

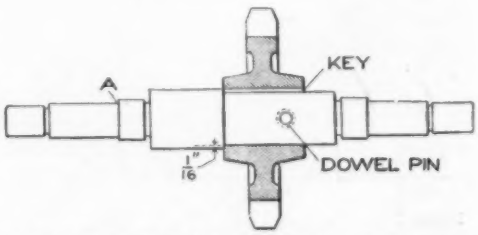
Two openings are made through the closed end of the smaller or movable tank, one to serve as air outlet and the other as an inlet. The outlet is made sufficiently large to fit an ordinary gas cock, which should be soldered in place, and connected to the gas burner with a suitable rubber hose. The inlet opening is cut to fit a suitable pipe flange, which is soldered or riveted in place and fitted with a plug to open or close it. Four chains or cords are evenly spaced and connected to the rim of the movable tank, to hold it in an inverted position. They are fastened at their loose ends to the weight cord, which passes over the pulleys to a regulating weight, used to govern the descent of the movable tank. To get higher pressures than produced by the unbalanced weight of the tank, additional weight may be added on the tank.

To operate the device, the lower tank is filled three-quarters full of water. The movable tank with its outlet open is placed in its upper position, and then closed up with the plug, and connected to the gas burner by a rubber hose. When the gas cock is opened, the excess weight of the tank will cause it to descend, forcing the air through the rubber hose to the burner. When no more air can be forced out of the upper tank, the outlet must again be opened and the tank raised to its upper position. With the outlet again plugged, the operation will proceed as before.—Contributed by J. Koestner, Brooklyn, New York.

Repairing a Broken Magneto Drive

The combination sprocket and shaft, driving the magneto of an automobile gasoline engine, was fractured at a point marked A. The break may have been caused by defective material, or perhaps the heat treatment was not of the proper kind. The shaft was of such design that the drive sprocket was forged integral with the shaft; then, too, the entire piece was heat-treated and ground. This made it an extremely expensive part if a new one had to be purchased.

To make a repair, a new shaft was turned up, without a sprocket, having the same dimensions as the broken shaft, which was removed from each side of the sprocket and the faces of the latter were ground flat on a grinder. A hole was then bored and reamed



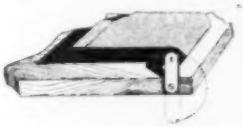
New Shaft Replacing a Broken One Consisting of Shaft and Sprocket in One Piece

centrally in the sprocket, to fit on the new shaft. A keyway was cut in the sprocket and one to match it in the

shaft, and a hole was bored for a dowel. The shaft was then casehardened and ground to a press fit in the sprocket bore, with a shoulder $\frac{1}{16}$ in. high to provide a stop. When the sprocket was in place a pin was driven into the hole and riveted on both ends.

Drawing-Board Cover

Having trouble with dust settling on my drawings over night I made a cover, as shown in the illustration, that can be easily drawn in place and does not interfere with the work on the board. Two pieces of steel, each $\frac{1}{8}$ in. thick, $\frac{3}{4}$ in. wide, and about 2 in. long, are secured at the right end of the board, one on the top and the other on the bottom edge. An ordinary window shade with a spring roller of the proper length is fitted between the two pieces of steel. When not in use, the roller with shade hangs under the board as shown by the dotted lines.—Contributed by Lawrence L. Lane, Jackson, Tenn.



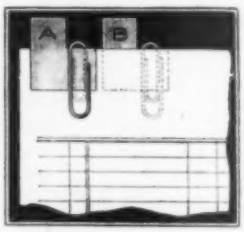
Temporary Repair for a Burned-Out Fuse Plug

When a house fuse plug "blows" out and there is no other at hand, take a bit of tin foil—the covering from a pack of tobacco or chewing gum will do—and fold it once, making the strip about $\frac{1}{2}$ in. wide, then lay it over the contact points of the plug, as shown, and screw the plug into the receptacle. This will make a connection, and will not produce any more body than if the ordinary fuse wire were used.

¶A streaked top lining on an automobile can be made uniform in color by applying a dye of the proper shade while the top is upside down.

Making Index Cards

Anyone making his own filing systems will find the method illustrated one of the quickest and easiest for constructing index cards. To one of the regular cards in the cabinet attach a piece of cardboard, or any suitable material, cut to the shape shown at A, with a paper clip to keep it in place. The target can be slipped along on the card or it can be placed behind it, as shown at B. Owing to the manner of fastening, any number of cards can be made with targets.



A Twine Holder

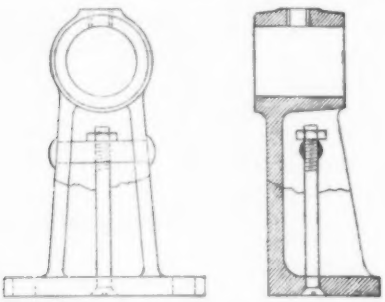
A serviceable twine holder can be made from a wire guard of an electric lamp. The guard is fastened to the wall, or other support, with a single staple over the wire ring at the top. Lift the guard and insert the twine from the back side. The weight of the ball will hold the guard in place. The twine is taken from the small-end opening in the guard.—Contributed by W. H. Sargent, St. Johnsbury, Vt.

An Acid Test for Metals

File, or grind, the pieces to be tested and polish them smooth, then place them in a dilute nitric or sulphuric-acid solution for a day. Wash and dry the pieces, and if they are of the best steel, the surface will have a frosty appearance. Ordinary steel will have a honeycomb surface, and iron will present a fibrous structure running parallel with the direction in which the metal was worked.

Repair for a Small Broken Bracket

A simple and cheap repair for a broken automobile-fan bracket, or a similar casting, can be easily made as

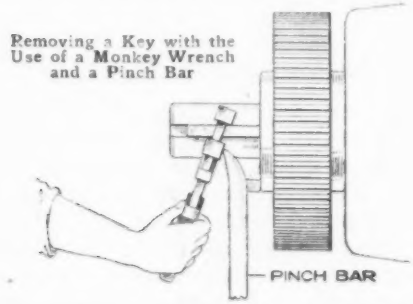


The Parts of the Casting are Held Together with a Screw, or Bolt and Nut

illustrated. A hole is drilled through the sides of the upper, or bearing, portion, and a rivet, or suitable rod, inserted and securely riveted in place. The two parts should then be assembled, and held together with clamps, while a hole is drilled and countersunk through the base and rivet body, to fit a suitable flat-headed machine screw. When assembled, the parts are securely held in place with the screw and nut connecting the base with the rivet.

Removing a Plain Key with a Monkey Wrench

Considerable skill is frequently required to remove plain keys fitted in places where it is impossible to get at them with a drift. One of the simplest

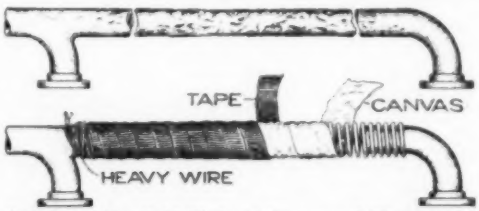


Removing a Key with the Use of a Monkey Wrench and a Pinch Bar

successful methods of obtaining the desired result is the use of a monkey wrench and pinch bar, as shown in the illustration. For this purpose a wrench should be used that has sharp edges on its jaws, so these can get a good grip on the key. To further improve the method, grooves may be cut on opposite sides of the key, so the jaws will fit better when straddling the key at a slight angle with the face of the keyed machine part. By using a pinch bar against the movable jaw, sufficient force can be applied to remove the key, unless it is so tightly driven, or rusted in place, that it will have to be drilled out before it can be released.—Contributed by J. V. Romig, Allentown, Pa.

Emergency Repair on Automobile-Engine Manifold

The water-outlet manifold on the gasoline engine of an automobile was very old and corroded, and the pressure of the circulating water fractured the center portion of the pipe and made two pieces of it while out on the road. The repair illustrated was done in a short time and enabled the driver to



Substitute Manifold Made of Canvas and Electricians' Tape over a Spiral Wire to Form a Hose

reach home, after which it served the purpose until a new manifold could be obtained.

A close-wound spiral spring of ordinary iron wire was wound around the circumference of the hand pump. The spiral ends were fastened to the broken ends of the manifold. Strips 3 in. in width were then cut from an old piece of canvas found in the tool box and wound tightly around the spring for the full length, after which electricians' tape was wound tightly over the canvas. White lead was inserted at both ends to prevent leakage, and the ends were then clamped to the metal with wire.

Building a Home

By GEO. M. PETERSEN

PART II—Planning the House

AFTER the lot has been selected and the location of the house decided upon, the amount to be used for building purposes should be fixed. It is impossible to set a rule for the value of the building, but the cost should not exceed an amount that can be readily liquidated when the time comes for settlement. It is best to figure the amount of rent a person is paying, or can afford to pay, and see if it will carry the building account. Some of the items which are included in the carrying charges of a property are lost interest on the money invested; interest on the mortgage; fire insurance; city and county taxes; water tax; assessments for repaving the street and building new sewers; repairs, and depreciation. If the rent, which is credited to the house account, will pay 10 per cent gross on the investment, it is reasonably certain that the property will be self-supporting, but be very careful to have the amount come under rather than over the fixed expenditures of the ordinary outlay or that which a person can handle financially.

When the cost is figured and the amount known, it is very easy for an architect to make preliminary sketches and submit them for approval. Upon receipt of the sketches the home builder should carefully look them over with a view of placing the furniture. Many houses have been completed before it was discovered that there was no wall space for the piano, the buffet, or bed. Note the layout for the bathroom and its size, which should never be less than 6 ft. square. A few furniture dimensions are given herein to assist the owner in checking the plans for furniture space.

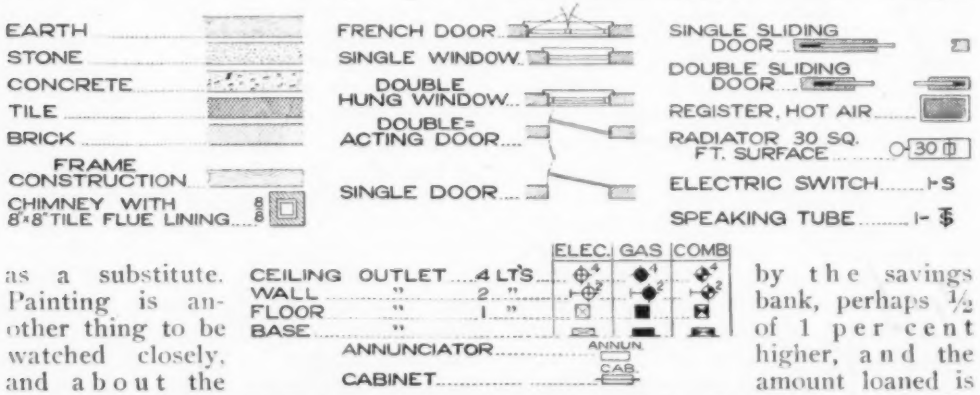
Single bedsteads are from 3 ft. to 4 ft. wide, the three-quarter bed is from 4 ft. to 4 ft. 6 in. wide, and the double bed is 5 ft. wide. There are also some dormitory beds that are only 2 ft. 8 in. wide. All bedsteads are from 6 ft. 6 in. to 6 ft. 8 in. in length. Headboards range from 5 ft. to 6 ft. 6 in. in height. Bureaus and dressing tables vary a great deal in size and length, but a space 4 ft. long and 1 ft. 8 in. deep will accommodate them. The average height, exclusive of mirrors, is about 3 ft. Chiffoniers are about 3 ft. long, 1 ft. 8 in. deep, and 4 ft. 6 in. high. Wardrobes come in two general sizes, namely, 4 ft. 6 in. wide, 2 ft. deep, and 8 ft. 2 in. high; and 3 ft. wide, 1 ft. 6 in. deep, and 6 ft. 9 in. high.

Sideboards vary from 4 ft. to 6 ft. in length, and from 1 ft. 8 in. to 2 ft. 4 in. in depth. Upright pianos run from 4 ft. 10 in. to 5 ft. 6 in. in length, 4 ft. to 4 ft. 9 in. high, and 2 ft. 4 in. deep. A space 2 ft. deep and 4 ft. long should be allowed for the kitchen range, but it is better to select this piece of furniture before planning the house, on account of the variation in the size. The illustration shows how the layout for the furniture will appear on the plans.

It is advisable also to check up the closet space shown on the plan and see that no closet is less than 20 in. deep. Stairways should be considered as to the run or tread, which should not be less than 8 in. for basement stairs, 9 in. for inside stairs, and 12 in. for porch steps. The proper proportion of treads and risers can be figured by adding them together, and their sum should be from 17 to 17½ in. The headroom in the basement must not be less than 7 ft. from the top of the concrete floor to the bottom of the girder. Always see to it that plenty of nails are used, as it is better to have too many than not enough. See that each stone in the foundation is laid on a solid bed of lime and cement mortar, and have the plates laid in a bed of mortar. Use a good grade of building paper between the floors and for the oversheathing. The shingles should be put on the roofs with galvanized, cut nails. The most common symbols for designating lighting fixtures, and sundry other equip-

ment, are shown in one of the illustrations. There are many tricks used by dishonest contractors, and a few of them are mentioned here as a warning. Ashes, as well as other refuse, are used in constructing concrete foundations; 2 by 2 in. studs for partitions in the place of 2 by 4-in. material; chestnut, or yellow-pine doors, flooring, and trim, where oak is specified; tile seconds in bathrooms. Tile seconds are slightly discolored, and when laid have a poor appearance. Redwood window frames are used where white pine is specified; a poorer grade of flooring and a smaller furnace than called for in the specifications are often substituted; two registers are connected on one run of pipe; and numerous other fraudulent practices to save on the price of the material going into the house are resorted to.

The hardware is another item where there is opportunity to cheat. It is not uncommon to find plated steel where bronze is specified, as there is no way of distinguishing one from the other except by using a magnet. Naturally the plated steel will attract the magnet and the bronze will not affect it. As bronze hardware costs almost three times as much as steel, it is quite a temptation for the dishonest contractor to use the cheaper grade as a substitute. Painting is another thing to be watched closely, and about the only way to know that the proper material is used is to have the painter open the original packages and to see the colors mixed on the job. Look out for cheap varnishes, as they will present a high gloss that will not stand in use.



The Novice will Find Many Characters or Symbols on the Plans, and It Is Necessary to Know Them So That the Work may be Checked, as Well as the Kind of Material and the Location of the Fixtures

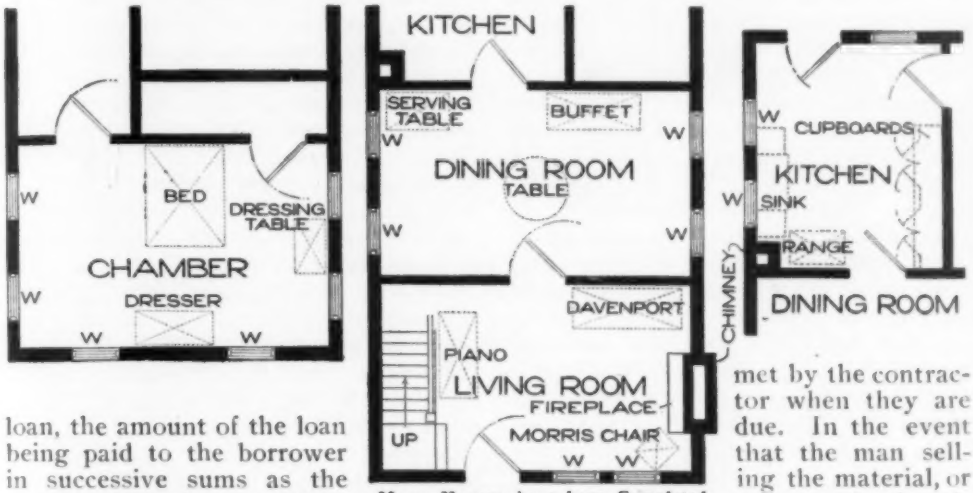
If it is desired at some future time to make additions for more rooms or sleeping porches, or to finish off rooms in the attic, the house should be so arranged that this work may be done without the necessity of remodeling the entire house.

Mortgage Loans

If it is necessary to borrow money for building purposes, there are three sources from which it can be obtained by placing a mortgage on the building, namely, a private party, a savings bank, or a building and loan association. A private lender will usually give a larger loan on the property than a savings bank, but the bank, on the other hand, charges a lower rate of interest. The interest on either of these mortgages is payable semiannually while the building and loan association mortgages require a weekly or monthly payment on the principal, together with interest on the unpaid balance. The amounts of these payments vary, but are usually figured out so that the mortgage is fully paid up in from 7 to 13 years. Most building and loan companies require a monthly payment of $10 for each $1,000 loaned. The rate of interest is about the same as charged by the savings bank, perhaps ½ of 1 per cent higher, and the amount loaned is greater, so that for the average person who really wants to own a home, the building and loan association proposition is a good one.

There are two regular kinds of

mortgage loans, the straight mortgage and the building-loan agreement. The latter is sometimes called a progressive loan, the amount of the loan being paid to the borrower in successive sums as the construction of the building progresses. This kind of a loan is usually obtained from a private party and occasionally from a loan association, but seldom from banks. The building-loan agreement is usually drawn up in legal form similar to a mortgage, but stating when the payments are to be made, such as a certain amount when the foundations are in and the framing commenced; another amount when the building is under roof; another when plastered, and the remaining amount when the house is completed. A copy of this agreement is filed in the office of the clerk for the county where the building is located, which protects the mortgagee's interest. This style of a mortgage is very desirable for the builder, but since the loan is made from the plans and specifications instead of from the completed building, very few mortgagees care to make such loans.



Many Houses have been Completed Before It was Discovered That There Was No Wall Space for the Piano, Buffet, or Bed; Consequently These Locations must be Noted on the Plans, and Spaces Arranged for Them

Mechanic's-Lien Law

There is another important thing which the owner must watch closely, and that is the mechanic's-lien law. This law differs somewhat in various states so that it would be impossible to give all the laws in this article. As an example, however, the lien law of the state of New York will be considered. In this state the owner is fully protected so long as the payments are met by the contractor when they are due. In the event that the man selling the material, or the mechanic, is not paid by the contractor, he may file a lien on the property owner and the contractor jointly. If the building is not finished at the time the lien is filed, the owner has the right to finish the building and deduct the amount expended to complete the building from the amount of the contract. Any balance which may be still due the contractor is then paid to the lienor or lienors in the order in which their liens are recorded, and any balance which may remain after all liens are satisfied is turned over to the contractor. If sufficient funds are not due the contractor to satisfy all liens the only redress that may be had by the lienors is a deficiency judgment against the contractor. The liens are all paid in full, when possible, in the order in which they were filed, except that all labor claims are paid before the parties selling the material can collect their claims, and the subcontractor comes last on the list.

If the owner refuses or neglects to pay the contractor, the property may be sold at auction, and the amount so realized is used to pay up the claims against the building. If, however, there

is a mortgage on the property, this must be paid, or assumed, by the party bidding it in, as the first mortgage is a first lien on the property and must be protected.

In some other states it makes no difference whether the contractor has been paid in full or not, the persons who have not received their pay for materials or labor can collect from the owner.

Building Contracts

There are three principal kinds of building contracts in use at the present time, viz., straight contract, lump-sum contract, and percentage contract. The first mentioned at one time was the most popular, but the percentage contract is rapidly gaining ground, as it is by far the cheapest and most satisfactory method of doing construction work.

The straight contract is one in which the contractor agrees to do the entire job for a specified sum of money, to be paid in fixed sums at certain times as the construction progresses. This form of contract gives the contractor a chance to use poor material and slight the work to save a few dollars.

A lump-sum contract is one wherein the contractor agrees to perform all labor and furnish all material necessary for the proper completion of the building, for cost, plus a lump sum for his profit. This form of contract leaves the contractor no reason for slighting either the material or the labor, nor can he gain anything by running the expense higher than necessary.

A percentage contract is an agreement whereby the contractor agrees to build the house for cost, plus a certain percentage for profit. This is the proper and most satisfactory method of building, and is rapidly replacing the straight contract among those well informed in building construction. The main thing, however, is not so much the kind of agreement the contractor works under as his reputation for doing the work at a reasonable margin of profit, and well. The better contractors in some places decline a contract job, as they are kept busy on percentage work.

Summed up briefly, the straight contract either forces the owner to pay an unreasonably high price for the house, or else tempts the contractor to substitute poor materials and cheap labor in order to break even, should he have forgotten something when figuring the cost. This means that the owner must supervise the work very closely to avoid substitutions. If the contractor sets out to make up a loss, he will succeed, no matter how close the supervision, and for that reason the work should not always go to the lowest bidder.

With the percentage contract, however, all the tricks of the trade and forgotten costs are eliminated. The owner need not worry about the quality of the materials or labor, as the contractor has nothing to gain by slighting them. The contractor is really put on his honor and works as the owner's agent in getting the best results.

Shaping Irregular Surfaces on a Metal Planer

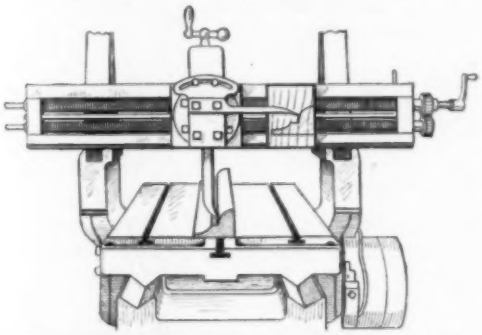
Considerable skill and care is required in planing irregular surfaces to a definite outline, but with the aid of the tracing arm and template of the desired shape, as illustrated, the work can be easily and accurately done.

To make the necessary changes, one of the straps on the tool post, for clamping the tool, must be removed—either the upper or lower can be used, whichever is most convenient. In its place is attached the tracing arm, being a duplicate of the removed tool strap, but having a long, rigid extension on one side terminating in a dull, bent chisel point for following templates. The outline to be planed is marked off and cut out of a hardwood block, or thin metal plate. This is fastened to a suitable block for clamping it to the planer cross rail, so that the template and the

outline of the work, when finished, both have the same position relative to the planer bed. If possible, it is best to mark the desired outline on the work before machining it.

In setting the tool, special care should be taken to see that it will start at the place on the work corresponding to that occupied by the tracing arm with respect to the master template. If this precaution is not taken, the tool may either cut too much, or run off, and the piece will be spoiled. If the desired shape is very irregular, several kinds of tools may have to be used, so that, in setting a new tool, it is best to locate it and the tracing arm on some finished part of the work.

Both the horizontal and vertical feed must be operated by hand, unless the

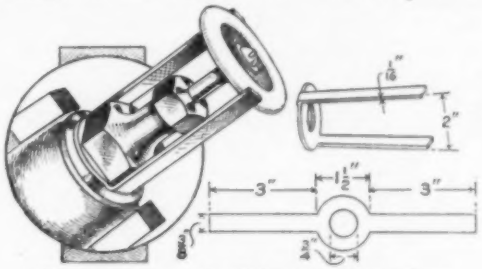


The Pointer Following over the Master Template Guides the Tool in Shaping the Work

outline is very simple. In such cases it might be advisable to remove the horizontal-feed screw in order to secure an automatic side feed, produced by a spring, or cord and weight, attached to the planer head, which tend to keep the tracing point—which should be strengthened for this purpose—pressed against the master template.—Contributed by A. Kerbaugh, Allentown, Pa.

Locking a Valve

The control valve on a water tank in a shop was almost worn out, and the constant vibration caused the valve to work loose. To eliminate this trouble, a clip was made to hold the handle in position. A piece of $\frac{1}{16}$-in. sheet brass was cut to the dimensions shown, after which it was bent to form the shape of the letter "U." The clip was



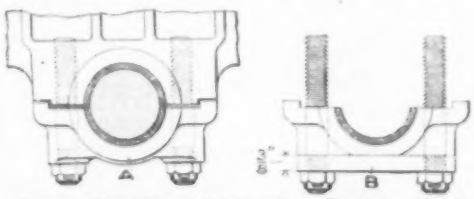
Clip to Fasten on the Valve to Hold the Stem from being Turned by Vibration

then placed in such a position on the valve that the two projecting arms held the valve wheel in place.

To Prevent Broken Bearing Caps

One of the most frequent gasoline-engine breakdowns is the rupture of a crankshaft-bearing cap. These caps are usually made of aluminum, and the fracture occurs at the point A. The trouble, in most cases, is due to screwing down the bearing studs too tightly, thus causing a strain on the metal in the center.

To eliminate such accidents the following method will be effective. The first operation consists of facing off the lower surface of the cap on a planer, or milling machine. A piece of $\frac{3}{8}$-in. cold-rolled steel is then cut to fit the shape of the cap and drilled for the



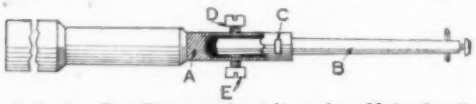
Bearing Cap Planed Off Level, to Receive a Steel Strip to Take the Strain off the Studs

studs, after which it is bolted in position, as shown at B. In this manner the entire strain imposed by the two nuts is carried on the strip of steel.

¶The forward gear on an automobile should never be engaged after reversing until the car is practically standing still.

Adjustable Boring Bar

Quite frequently a tool in a boring bar is to be adjusted for a deeper cut when the cutter is at the inner end of

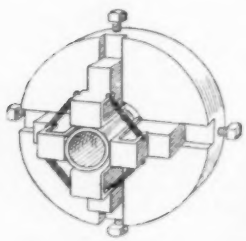


A Boring Bar That can be Adjusted to Make Small Changes without Resetting the Tool

the work. In an ordinary bar, this adjustment can usually be made only after the tool is withdrawn from the work. The illustrated bar overcomes this difficulty. The main bar A is drilled slightly larger than the diameter of the tool holder B, which is held in place in A by means of a taper pin, C. The tool holder B can then be swung back and forth slightly, but is held in any set position by the adjusting screws D and E. When starting an in-cut, the bar B should be held by the screw E only. If it is desired to take a deeper cut when returning, the screw E should be loosened slightly and D turned up tight, again holding B in a rigid position, but at a new setting.—Contributed by Jos. J. Kolar, Maywood, Ill.

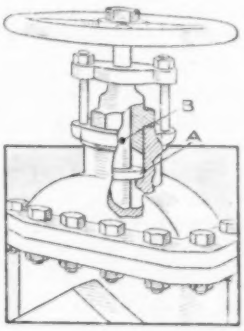
Holding Protection Strips on Chuck Jaws

The rechucking of finished work usually necessitates the insertion of copper or other soft protection strips between the work and the jaws. These strips are not only hard to get in place, but they drop out easily and unexpectedly when the jaws are loosened in centering the job. A simple means of preventing this annoyance is shown in the sketch. Make strips to conform to the shape of the jaws, as shown, but allow for an extra width of about ⅛ in. on each side for drilling holes of a diameter to loosely fit the connecting spring wires as shown. In adjusting the jaws, the protection strips will move with them, being held in place by a spring of the same strength on each side. This scheme will work on any number of jaws, and is particularly valuable when a large number of pieces must be rechucked.



Changing a New Valve Stem to Fit an Old Valve

In filling an order for a new gate-valve stem of the nonrising type, one was sent which lacked about 1½ in. at the inner end, as shown in the sketch, to permit closing the valve. There was sufficient extra length on the outer end of the stem to allow it to occupy a lowered position without causing any interference between the hand-wheel and packing-box gland. A hole was drilled, 1½ in. above the shoulder A, and a pin, B, corresponding in length and thickness to the diameter and thickness of the shoulder, driven into it. The shoulder was then chipped off, thereby allowing the stem to drop down to the closed position of the valve, and the pin to fit in the place previously occupied by the shoulder. The parts were then reassembled, the only difference being in the location of the stem, and the substitution of the pin for the chipped-off shoulder. All upward and downward movement of the stem was prevented by the pin, just as it would have been by the shoulder, but an increased length of stem was provided, enabling the valve to close tightly.—Contributed by F. S. Johnson, Corona, Cal.



¶ Washing soda, gum arabic, and water make a good writing fluid for fine lines on blueprints.

To Locate and Correct Troubles in Direct-Current Dynamos

By A. E. ANDREWS

PART III—Speed and General Suggestions

Speed Too High

IF the governor on the engine fails to respond quickly under a varying load, adjust it to the proper regulation if possible. It should be governed closely from "no load" to "full load" with the proper steam supply. Where a series motor takes too much current for a given load and the motor runs away, put in a shunt, and regulate until the proper current is obtained. If a series motor is run on a constant-current circuit, use the proper regulator for controlling the magnetism of the field for a varying load.

To remedy a motor running at a too high speed on a constant-potential circuit, put in a resistance to cut down the current; use the proper regulator or controlling switch, or change to an automatic speed-regulating motor.

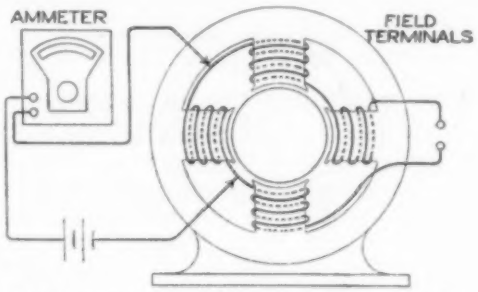
If the regulator, or field rheostat, is not properly set, or the voltage is too high for a shunt motor, the speed will run high. To make the proper change, adjust the regulator, or field rheostat, to control the speed, in the first instance; and use the proper voltage and rheostat, in the latter.

Speed Too Low

A low speed may result from the same cause as a high speed in respect to the engine governor, and its remedy is the same. An overload of too many lamps on the circuit; a short circuit in the armature; striking or rubbing of the armature on the pole pieces, friction or a weak magnetic field, may also cause low speed, and remedies for these troubles have been described in a previous chapter.

Motor Stops

If a motor stops, it may be due to excessive voltage on a constant-potential circuit; to excessive amperage on a constant-current circuit; to friction, or too great a load on the pulley. Open the switch, locate the trouble, and remove the cause. Keep the switch open and the arm of the rheostat on the position "off" while locating and repairing the trouble, then close the switch and move the arm gradually to the position "on," to see if everything is correct. With a



The Manner of Attaching an Ammeter to Test Out the Field Coils for an Open Circuit

series motor no great harm will result from the motor stopping or failing to start. If it is a shunt motor on a constant-potential circuit, the armature may, and probably will, burn out, or the fuse blow.

A motor will stop on an open circuit caused by the melting of the safety fuse; by a broken wire or connection; by brushes in contact; by an open switch, or if the current fails, or is shut off from the station. Open the switch, locate and repair the trouble. If a fuse is out, put in a new one, and in case of a broken line, find it and make the repair. See that the brushes are in close contact. If a switch is open, close it, but before doing so, see that the starting resistance is in the circuit. In case of current failure, open the switch, return the starting lever to the position "off" and wait for the current, testing from time to time by closing the switch and moving the starting lever to the first closed-circuit position.

A complete short circuit of the field will cause a motor to stop. Test out for the fault, and make the repairs if possible. A method for making the

test is shown in the sketch. The ammeter should read the same for all coils if there is no trouble. It will read zero if the coil is open, and a maximum if the coil is completely shorted. Inspect the insulation of the binding posts and the holders. Poor insulation, oil; dirt, or copper dust may cause a short circuit.

The same trouble will result from a short circuit in the armature, or complete short circuit of the switch. The same remedy is applied as in making the repairs for the field.

Motor Runs Backward against the Brushes

This trouble will result in making the connections the wrong way. Connect up properly by referring to the diagram sent with the motor. If a proper diagram is not at hand, try reversing the connections to the brush holders. Other changes may be made until the proper connections are found to rotate the armature in the right direction, then connect up permanently.

Dynamo Fails to Generate

This will occur from a reversed residual magnetism, caused by reversed current in the field coils. To correct, send a current from another machine, or from a battery, through the field coils in the proper direction. The polarity may be tested with an ordinary compass. If the connections of the windings are not known, try one and test; if not correct, reverse conditions, try again, and test.

Should reversed connections be the trouble, connect up properly for the rotation desired, using the proper diagram of the connections. See that the connections for the series coils, in a compound dynamo, are properly made, as well as those for the shunt coils. In case of the earth's magnetism interfering, use the same method as for reversed residual magnetism, which method also is applicable where another dynamo is in close proximity. If the brushes are not in the proper position, shift them until evidence of improvement is given. The position of the brushes for the best generating power should be clearly understood, and is generally at, or near, the neutral point. A too weak residual magnetism must be treated in the same manner as reversed residual magnetism. A short circuit will produce the same results, and must be repaired as described in previous paragraphs.

Should a lamp socket, or other part of the line, be short-circuited, or grounded, it may prevent the building up of the shunt, or compound machines. Locate and remedy the fault before closing the switch.

If the field coils should be opposed to each other, reverse the connections of one of the field coils, and make a test. A compass should show the pole pieces of opposite polarity. If, after such a trial, the dynamo does not build up, try sending a current from another machine through the field coils in the proper direction. If the polarity then does not come up in the proper direction, cross the field connections, or remagnetize them in the opposite direction.

The cause of the trouble may also be an open circuit caused by a broken wire; by a faulty connection; by brushes not being in contact; by a fuse having melted or broken; by an open switch, or by an open external circuit. Repairs are made as described, and in the last-mentioned case make a test with the dynamo switch open and kept open until the repairs are completed.

Where there is too great a load on the dynamo and it fails to generate, reduce the load to the pilot lamps alone, for a shunt, or compound machine. After the dynamo comes up to a full voltage, as shown by the pilot lamps or voltmeter, close the other circuits in succession and regulate the voltage at the same time. Where there is too much resistance in the field regulator, or field rheostat, gradually turn the regulating switch to cut out the resistance, and watch the pilot lamps or voltmeter when the dynamo comes up to the voltage, then regulate, etc.

General Suggestions and Precautions

Never use ice water to cool off the bearings, as it may get into the armature and ruin it, unless it has been made waterproof as in the case of street-car motors. Do not shut down because of a hot box resulting from poor oil, dirt or grit in the bearings, tight journals, or too great a load or strain on the belt, until their remedies have been proven useless. If absolutely necessary to shut down, take the belt off the pulley as soon as possible. Do not allow the shaft to "stick" in stopping. Take the boxes, or bearings, out and cool them off naturally as soon as possible, and not in water, as this may ruin them. When cool, scrape, fit, polish, and clean the shaft, and test for free turning by hand, before belting up and starting again.

Cleanliness about a dynamo, or motor, is imperative. Dirt, oil, or copper dust may prove a source of great annoyance or damage. Small tools, bolts, or pieces of iron must be kept away from a dynamo, as they may be drawn into, or fall upon, the armature and ruin it. Never allow loose articles of any kind to be placed upon any portion of a dynamo.

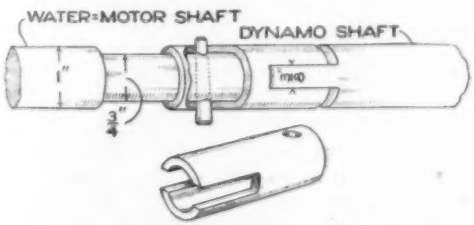
Brass, or copper, oilcans are the best to use, as they are nonmagnetic. All the connections must be large, clean, and firm. Look over and tighten the loose connections, screws, and bolts daily.

Always keep copper brushes raised from the commutator when the dynamo is at rest. Poor, cheap oil is not economical. Use none but the best of mineral oils, and filter new oils before using them.

Keep cotton waste away from the commutator; use canvas or cloth, and a pine stick makes a good burnisher to keep the bars clean and smooth.

A Detachable Shaft Coupling

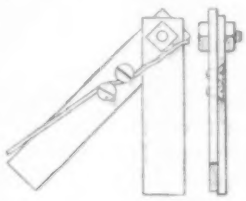
The simple shaft coupling illustrated was made for a combination water motor and electric-generating outfit. The coupling is inexpensive and has the advantage of being quickly disconnected. The shaft of the dynamo had a ⅜-in. tongue, and that of the water motor an ordinary shoulder. A piece of steel tubing was then cut to the proper length, with the necessary slots on one end to engage the tongue on the dynamo shaft. A standard taper pin held the tubing in position. To disengage, the taper pin is withdrawn, and the bushing is pushed to one side.



Sleeve Made of Steel Tubing Connecting a Dynamo Shaft with a Water-Motor Shaft

Simple Wire Straightener

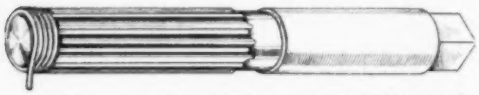
The few parts necessary to make the illustrated wire straightener are as follows: Two pieces of ¼ by 1-in. iron; two flat-head machine screws; one bolt and nut, with a washer to fit, having a thickness approximately equal to the diameter of the wire. The ¼-in. pieces should be drilled near one end to fit the bolt. In one piece two holes should be drilled and tapped for the machine screws, these being set in so their heads project an amount approximately equal to the diameter of the wire.



To use the straightener, open out the ends, insert the wire, and close up the parts; then draw the wire back and forth, holding the straightener at an angle with the wire so one screw bears against the top and the other against the bottom of the wire.—Contributed by D. C. Goff, Knoxville, Tenn.

Repairing a Reamer

A reamer is easily broken on the points of the cutters at the end. As the cost of these reamers is rather high, it



The Cutters are Ground Down and Then Wrapped with Fine Wire and Soldered

is desirable to repair them whenever possible. A very good repair can be made by grinding the end of each cutter down to a level a trifle lower than the break and winding this part with copper or soft-iron wire, then soldering it in place. The solder is then smoothed up with a file.

To Prevent Automobile Crank Handle from Sticking

Sand and dust collecting in the sleeve of an automobile starting-crank handle will cause it to stick. To remedy this trouble, remove the handle and turn the pin down in the center about ⅛ in. deep for a length of 2¼ in. This groove is then filled with ordinary packing. In this manner the sleeve will be kept well lubricated, and the sleeve will always slide loosely on the shaft pin. If two small grooves are cut lengthwise of the raised end portions, the grease, or oil, can easily reach these bearings.

An Adjustable Lap

In the ordinary lap, a piece of brass rod of suitable size is slotted in the

A Headless Screw Controls the Adjustment Accurately, and Holds the Parts Rigidly

center for some distance, and a wedge-shaped piece of metal is inserted in the slot. This will not give a fine, or solid, adjustment. An improvement, which will give a better adjustment, consists of a tapped hole in the portion A, and a headless screw, C, used in it. The screw, when turned in, will force the portion B away to any desired position.

A Thread-Cleaning Tool

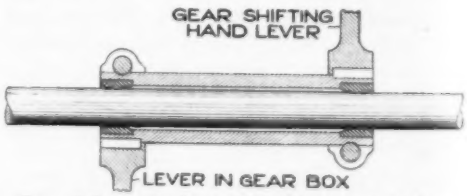
The tool illustrated will be of great help for anyone handling rusted bolts. It is made of a piece of steel of suitable size with a number of holes

Bar with Tapped Holes, and Slotted, for Cleaning Out Rusted Threads on a Bolt

drilled of sizes necessary to tap with standard taps. After cutting the threads with the taps, the steel bar is slotted as shown. This tool, run over the threads of an old bolt, will clean off the rust and dirt that may have collected, making it an easy matter to start the nut, which otherwise would be a troublesome task.

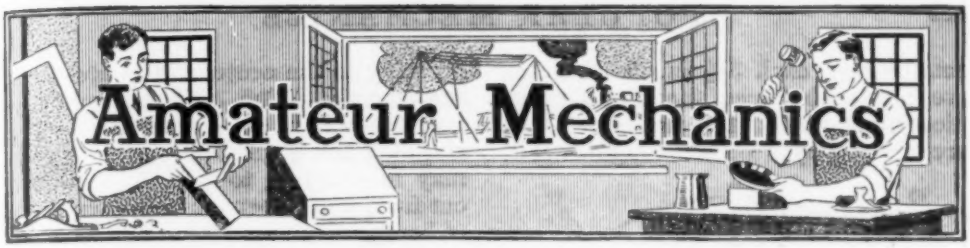
To Make Gear-Shift Lever Move Easily

Quite frequently a chauffeur will tug frantically at the shifting lever, in



Curved Inner Surfaces of Bushings on a Shifting Lever, to Make It Move Easily

an effort to engage the transmission gears, without success. Trouble of this sort is in many cases caused by the holding of the shaft connected to the shifting lever. To eliminate this trouble insert two bushings, one at each end, having curved surfaces. The clearance between the shaft and bushing should be not less than .005 or more than .01 inch.



How to Make Combined Kites

By C. M. MILLER

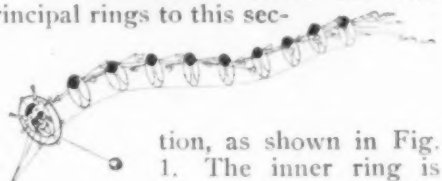
PART I—A Dragon Kite

DRAGON kites are made as hideous as the maker can possibly conceive, and while the one to be considered is no beauty, it is more droll than fierce-looking. In general appearance the dragon and centipede kites are like huge caterpillars floating about in the air. The kite sometimes twists and the balancer sticks appear to be large hairy spines. Usually the tail end swings higher than the head. It is like so many single kites, pulls hard, and requires a strong cord for the line. The individual circular sections may number 20, and if placed 30 in. apart, would make a kite about 50 ft. in length, or the number of sections may be more or less to make it longer or shorter. The kite will fold up into a very small space, for carrying about or for storage, but care should be taken in folding not to entangle the harness.

In General Appearance the Dragon Kite Is Like a Huge Caterpillar Floating About in the Air

The Head

The head requires much more work than any of the other sections. There are two principal rings to this section, as shown in Fig. 1. The inner ring is the more important, the outer one being added for the protection of the points when alighting.



The construction of the framework is shown in Fig. 2. It is made entirely of bamboo. The bamboo is split into strips, about $\frac{3}{16}$ in. wide, for the ring A. As the bamboo strips will be much too thick, they must be pared down to less than $\frac{1}{16}$ in. The diameter of the ring A is 12 in., and a strip of bamboo to make this ring should be about 38 in. long, so that there will be some end for making a lap joint. The ends of the strip are held securely together by winding them with linen thread. The Chinese boys use strips of rice paper, about $\frac{1}{2}$ in. wide and torn lengthwise of the paper. The rice-paper strips are made wet with paste before winding them on the joint, and when they dry out the shrinkage will bind the ends securely.

Two crosspieces, of the same weight as the ring stick, are placed $3\frac{1}{2}$ in. apart, at equal distances from the center and parallel, as shown at B and C. The ends of these pieces are turned at a sharp angle and lashed to the inside surface of the ring A. To make these bends, heat the bamboo over a candle flame until it will give under pressure, then bend and it will stay in shape after it becomes cold. This method of bending should be remembered, as it is useful in making all kinds of kites. Two

small rings, each 3½ in. in diameter, are put in between the two parallel pieces, as shown at D and E. These are for the eyes of the dragon. The

FIG. 1

The Kite-Head Section, Having Horns, Ears, and Revolving Eyes, Is Very Hideous

rings are lashed to the two crosspieces B and C. As the eyes revolve in the rings they should be made perfectly true. This can be done by shaping the bamboo about a perfectly round cylinder, 3½ in. in diameter. To stiffen the whole framework, two pieces of bamboo, 1/16 in. thick, 1/8 in. wide, and 20 in. long, are lashed to the back as shown by F and G. There is a space of 3 in. between the inner ring A and the outer ring H, giving the latter a diameter of 18 in. It is made of a bamboo strip, 1/8 in. wide, and should be less than 1/16 in. thick. It may be necessary to make this large ring from two pieces of bamboo, to get the length, and in such case be careful to make a perfect ring with the ends well lashed together. Two short pieces are lashed to the two rings, as shown at J and K. The supports for the horns consist of two pieces, 1/8 in. wide and less than 1/16 in. thick, and they are lashed to the upper crosspiece and to both rings, so that the parts L and M are exactly halfway between the ends of the pieces F and G and radiate out from the center of the ring A, the other parts, N and O, pointing to the center of the eye rings, respectively. The ears are unimportant and may be put on if desired. The rings on the horns and the stick ends may be from ½ to 2 in. in diameter, cut from stiff paper, but if larger, made of bamboo.

Chinese rice paper is the best material for covering, and it should be stretched tightly so that there will be no buckling or bagging places. The only part covered is that inside of the inner ring A, the horns, and the ears, leaving the eye rings open. The shades are put on with a brush and water colors, leaving the face white, or it can be tinted in brilliant colors. Leave the horns white and color the tongue red.

The Eyes

The frame for each eye is made of bamboo, pared down to 1/32 in. in thickness and formed into a perfect ring, 3¼ in. in diameter. Each ring revolves on an axle made of wire passed through the bamboo exactly on the diameter, as shown at P, Fig. 3. The wire should be long enough to pass through the socket ring D or E, Fig. 2, also, and after the eye ring is in place in the

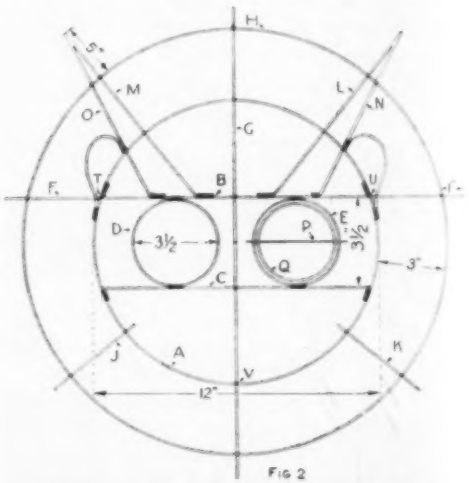


FIG 2

The Framework for the Head Section is Made Entirely of Bamboo Strips Lashed at the Joints

socket ring and the axle adjusted, the latter is fastened to the eye ring with a strip of paper wrapped tightly around the wire and pasted to the bamboo of

the ring. A glass bead, placed on the wire axle between the socket rings D or E and the eye ring Q on each side, keeps them apart and the revolving one from striking the other.

Each side of the eye ring is covered halfway with rice paper, as shown in Fig. 4. The part R is on the upper front half, and that shown by S is on the back lower half. Placing the two halves in this manner causes an unequal pressure of the wind on the whole eyepiece, and thus causes it to revolve on the axle. The front upper half of the eyepiece is made black, and the smaller dark portion extending below the darkened half is a round piece of paper placed just between the two halves so that half of it will show on both front and back of the eyepiece. When the eyepiece is given a half turn in its socket the back side will come to the front and will appear just the same as the other side. Some kite builders add pieces of mirror glass to the eyes, to reflect the light and cause flashes as the eyes revolve in their sockets.

A Section Kite

The ring for the section kite is made the same size as the inner ring of the head kite, or in this case 12 in. in diameter. The bamboo for making this ring should be ⅛ in. wide and 1/16 in. thick.

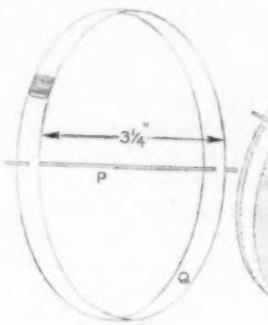


Fig. 3

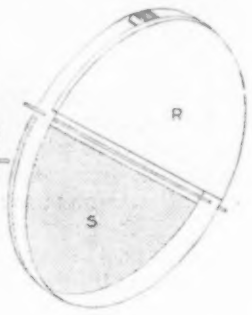


Fig. 4

Two Bamboo Rings with Paper Coverings, to Make Them Turn in the Wind, Constitute the Eyes

be made small, light and well balanced. Small tufts of tissue paper, or feathers, are attached to the tip ends of the balancer sticks, as shown in Fig. 5. The cover for the section kite is put on tightly, the same as for the head, the colors indicated in the sketch being only suggestions, as the builder can color them as desired. The balancer on the last section should have streamers, as shown in Fig. 6, for a finish. The streamers are made of light cloth.

The Harness

As previously stated, 20, more or less, sections can be used, and the number means so many separate kites which are joined together with three long

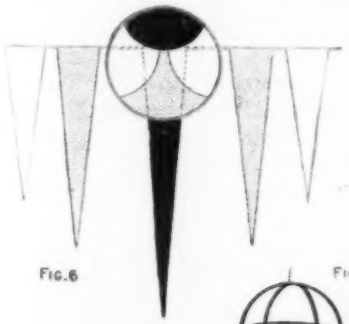


Fig. 6

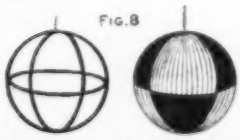


Fig. 8

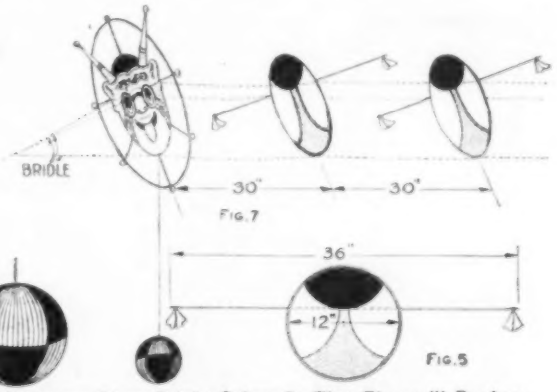


Fig. 7

Fig. 5

The Section Kites Have Balancers and the Disks are Given Bright Colors So That They will Produce the Effect of a Great Dragon When in the Air, the Head Piece Having a Ball Balancer Hanging from the Under Edge

The balancer stick, 36 in. long, is located about the same place as the cross-stick F, as shown in Fig. 2, and must cords, spacing the sections 30 in. apart. The cords should be as long as the kite from the head to the tail, allowing suf-

ficient extra length for the knots. As such a kite will make a hard pull, the cord used should be a six-ply, hard-twisted seine twine. Start by tying the three long cords to the head kite at the points T, U, and V, Fig. 2. Tie the next section at corresponding places just 30 in. from the head kite. The construction will be much easier if the head kite is fastened to a wall so that each cord may be drawn out to its proper length. Continue the tying until all sections are attached just 30 in. apart. Other spacing can be used, but the distance selected must be uniform throughout the length of the kite. The individual kites, or sections, may vary in size, or they can all be 9 in. in diameter, instead of 12 in., and the balancer sticks 30 in. long instead of 36 in., but a kite of uniform sections is much better and is easier to make. The positions of the sections as they will appear in the kite are shown in Fig. 7.

The Bridle

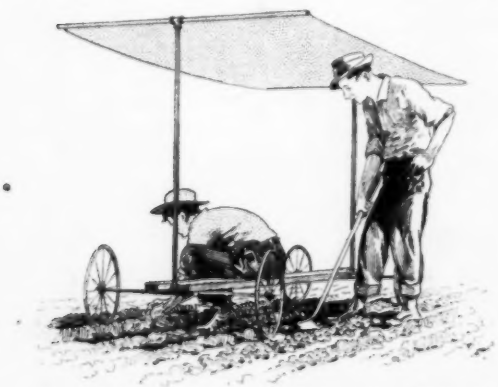
The Chinese bridle is usually made of three strings, which are attached to the same points on the head kite as the harness cords, or at T, U, and V. The lower string is longer than the two upper ones so that the proper inclination will be presented to the breeze. As the head is inclined, all the section kites will also be inclined. Some makers prefer a balancer on the head kite, and in one instance such a balancer was made in the shape of a ball. A ball made of bamboo strips is shown in Fig. 8, and is attached as shown in Fig. 7.

Flying the Kite

It will be necessary to have a helper, and perhaps two, in starting the kite up, as the harness might become entangled. Quite a little run will be necessary, but when up the kite will make a steady flier and will pull very hard. If the first attempt is unsuccessful, try readjustment of the bridle or a little different position in the breeze, and see that the balancers are not tangled. Quite a number of changes may be worked out on these plans, but it is necessary to bear in mind that the distances between sections must be equal and that the general construction must be maintained.

A Movable Sunshade and Seat for Garden Workers

Weeding gardens under a hot sun and in a necessarily uncomfortable position is by no means a pleasant occupation, but much of the hardship can be avoided if a combination movable sunshade and seat is made, as shown in the illustration. The framework consists of two end pieces, both made in the same way. Two ½-in. tees are required for each. These are connected with a 5-ft. pipe, for the upright, and the crosspiece that supports one end of the canvas consists of two pieces of pipe, each about 1½ ft. long, screwed into the tee. The axle for the wheels is also formed of two pieces of pipe, but these are only about 1 ft. long.



The Sunshade and Seat are Mounted on Wheels So That the Device can be Easily Moved About

Four suitable cart wheels should be provided, or solid circular disks cut out of a board or plank, and drilled for a ⅜-in. axle. Ordinary ⅜-in. washers are placed on each side of the wheels, one serving as a shoulder on the pipe end, and the other for the nut. The seat can be made of a 1 by 8-in. board, about 6 ft. 9 in. long, notched at each end to fit the pipe tees and prevented from shifting by means of U-bolts

around the axle on either side of the upright. After covering the top with canvas, fastened at each end around the upper crosspiece, the shaded movable seat is ready for service.—Contributed by W. E. Crane, Cleveland, Ohio.

To Keep Grass and Weeds Out of Tennis Courts

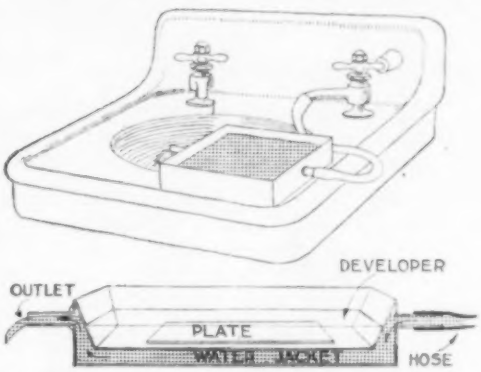
Tennis courts are very apt to become covered with grass and weeds unless considerable labor is expended on them. The best way to keep a court free from this growth is to put on sheets of tar paper close together when it is not in use. The paper should be cut in strips the proper length, so that they can be rolled up and set aside until the game is over, when they can be laid down again. After the court has been covered a few times, the grass will die out and disappear altogether. The use of salt, acids, and a number of other things, together with hoeing, were tried out, but the paper covering was the most successful of them all.—Contributed by W. D. Mills, Bakersfield, Cal.

Buttonhole-Bouquet Holder to Keep Cut Flowers Fresh

Being employed near a glass-blowing department I procured a small glass tube and made a buttonhole-bouquet holder. One end of the tube I closed and flared the other, then flattened the whole tube a bit. This tube, inserted in the buttonhole with a few drops of water in it, will keep cut flowers fresh for a whole day. If the upper end is flared just right it will fit the buttonhole and will not be seen, as the tube is hidden beneath the coat lapel.—Contributed by Frank Reid.

Cooler for a Developing Tray

Regardless of the fact that tank development for photography is the better method under most conditions, there



Water-Jacketed Tray for Use in Cooling a Developing Tray with a Flow of Water

are many who take special delight in tray development, because they enjoy seeing the picture as it develops on the plate or film.

There are many of this class of photographers both among amateurs and professionals, and they universally experience much trouble in keeping the solutions cool enough for good work in hot weather or a warm dark room. Many schemes have been used, but there is none simpler than that shown in the illustration. It is certainly better than letting the developing tray float in the bathtub, a common practice among amateurs who are compelled to use the bathroom as a dark room.

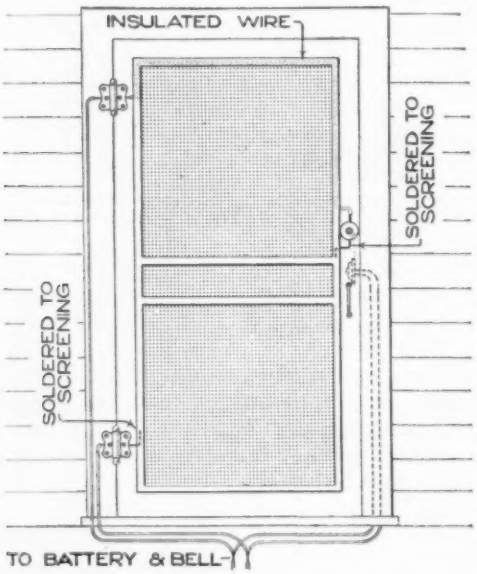
Any tinsmith can make a water-jacketed tray of zinc at a nominal price. If one expects to use it for developing films by hand, it should be made relatively deep, or at least shaped so that whatever method is used in manipulating the film will be suited to the size and shape of the tray. I had one made of zinc to accommodate an 8 by 10-in. plate and providing about ¼-in. space all around the sides and bottom of the inner tray for the circulation of the water.

Two brass gas tips were soldered into the ends of the tray and a rubber tube was attached to one of them, as shown.

By connecting this tray to the bathroom hydrant the developing solution can be kept as cool as desired without slopping water where it is not wanted. —Contributed by T. B. Lambert, Chicago, Ill.

Doorbell Push Button on Screen Door

Push buttons are frequently put in hallways, or other places, not accessible when the screen doors are hooked



Method of Connecting a Push Button for a Doorbell on a Screen Door

shut. By connecting an extra button on the screen door with the regular doorbell line, the service can be made to go on uninterrupted whether the screen be locked or open.

To do this, one wire, carefully insulated, from the outside button is laid under the upper molding strip of the screen, as shown, coming out through the hinge and passing down to the battery line, being concealed in any suitable manner, by molding or within the door frame. The button circuit is completed by connecting it to the screen with a short wire, the screen then acting as a conductor. If preferred, the line may be run down under the screen-door molding, and out through the bottom hinge same as with the other wire at the top. If the screen is used as conductor, a piece of wire should be connected to it near the bottom, and led through the hinge as before. In either case, after leaving the hinge, the wire must be led and connected to the battery line, to complete the circuit. It is then possible to operate the bell either from outside of the screen door or at the regular place within.—Contributed by E. M. Davis, Philadelphia, Pa.

Working Wood by the Application of Heat

It is often desirable to fit a piece of wood into a piece of metal by means of cutting a thread in the metal and screwing the wood therein. This can be accomplished by heating the metal to a little over the boiling point of water and screwing the wood piece into the metal while hot; or, if this is impractical on account of size, to heat the metal, make a screw plate by cutting a thread in a small piece of metal, the size and thread corresponding to the hole into which the wood piece is to be inserted, and heating it to the required temperature, then running the wood with some pressure through the thread. The wood then can be screwed into the larger piece, where it will hold firmly.

The process of heating wood without the aid of steam can be used to advantage in a number of ways; for instance, a hammer handle that is crooked can be straightened by careful heating without burning; also billiard cues, or almost anything of hard wood. It is surprising how easily it is done and how permanent the repair will be. The Indians at one time made their arrows from small hardwood twigs which were almost always crooked to start with, but after being dried they were warmed over a fire and straightened.

Another use for the application of heat is as follows: When it is desired to place a screw in a fragile piece of wood that is likely to split, if the screw is heated to a blue color and turned

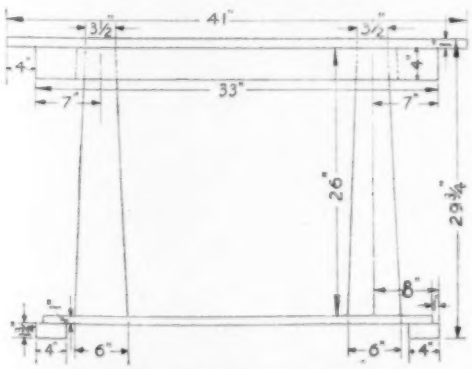
into the wood while hot, there will be scarcely any danger of splitting. In this case do not try to use oil or a lubricant of any kind, as the screw is sure to set before it is in place.—Contributed by James H. Beebee, Rochester, N. Y.

A Parlor Table

The material required for the parlor table illustrated is as follows:

1 table top, 1 by 26 by 41 in.
1 bottom shelf, 1 by 15 by 35 in.
2 side rails, ¾ by 4 by 33 in.
2 end rails, ¾ by 4 by 21 in.
2 top cross braces, 1 by 4 by 19½ in.
4 feet, 1¾ by 4 by 4 in.
2 posts, 6 by 6 by 26 in.
2 side corner strips, 1 by 1 by 31½ in.
2 end corner strips, 1 by 1 by 17½ in.

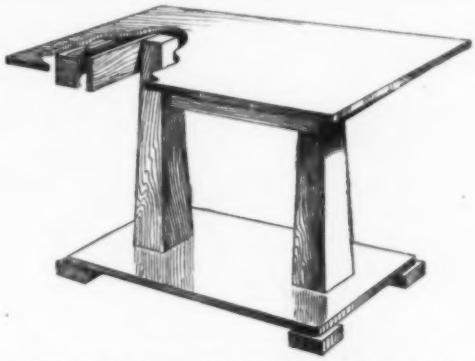
The bottom shelf can be made of two pieces of 1-in. material, 8 in. wide, carefully glued together, and reinforced on the under side with two crosspieces, glued and screwed to it. The foot pieces are secured to the bottom shelf so as to project 1 in. on the ends and sides. In case a center support is deemed advisable, another foot piece can be added, but unless the floor is very level, rocking may result. The uprights, or posts, are made from solid 6 by 6-in. lumber, 26 in. long, carefully squared at the ends, and tapered to 4 in. square at the upper end. If desired, the posts can be made of



Detail of the Parlor Table, Together with Dimensions of the Pieces

boards, cut and fastened together to form a hollow tapered post. In either case, they should be set in about 4 in. from each side of the bottom shelf and fastened to it by means of screws.

The rail pieces for the table top



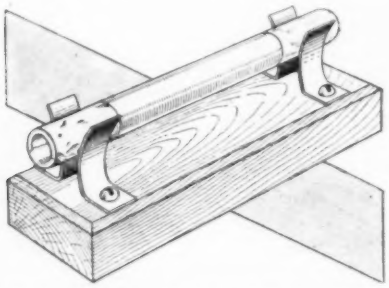
Design of a Table That will Appear Well in the Different Oak Finishes as Well as in Mahogany

should be cut and fitted with mitered joints at the corner to form a rectangular frame, 21 by 33 in. This is glued to the top and may be toenailed to it; but to provide a more secure bracing, a 1-in. square strip of material is fastened all around the inside edge of the rails, flush with their upper edge. The top is screwed to this. In order to prevent tipping when the top is resting on the 4 by 4-in. ends of the posts, two cross braces are provided. These should be screwed to the outer-end sides of the posts, and beveled off on their upper edges to fit the table top. They should be of such length as to have a tight fit between the side rails, and are fastened to these by means of finishing nails driven from the outside. Gluing and toenailing can also be used to secure the top more firmly to the braces; care should be taken that no nails cut through the table top. After thoroughly sandpapering and smoothing off the table, it can be finished to suit.—Contributed by H. J. Blacklidge, San Rafael, Cal.

Homemade Fuses for Battery Circuits

To carry out the general arrangement of the regular electrical equipment of a large power plant, the battery circuit should have some sort of a fuse block. An excellent way to

make such a block is as follows: Procure a piece of glass tubing, about 1 in. long, and make a mounting for it with four pieces of sheet brass, as



The Fuse is Well Insulated and Protected against Fire the Same as the Large Fuse

shown in the sketch. The brass pieces are shaped and fastened to a wood base so that their upper ends form a clamp to hold the glass tube.

A very thin piece of tinfoil, about 1½ in. long, is cut ⅛ in., or less, in width, the size depending on the amount of current used. This is placed in the glass tube and the ends are bent over the edge. A piece of tinfoil is then wrapped around each end, over the ends of the inclosed piece, and pasted to the tube.

The fuse thus made is pushed into the spring clamps of the block which are connected in the circuit.—Contributed by Charles W. Meinberg, Somerville, Mass.

Reproducing Flowers and Leaves in Colors

A very cheap, easy, and quick way to make reproductions of flowers, leaves, insects, butterflies, etc., is the following: Purchase 1 oz. of bichromate of potash and dissolve it in water. Spread this fluid over the surface of the paper upon which the picture is to be made, using a soft brush, and place it in a dark room to dry. When dry it will be a light lemon color.

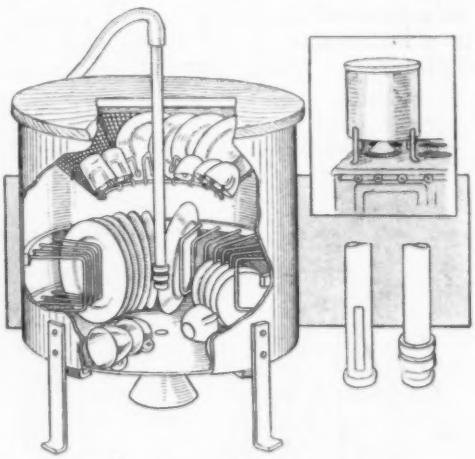
The leaf, or part to be reproduced, is placed upon the yellow side of the paper and the whole exposed to the sunlight. The uncovered portions will gradually turn brown, while the part covered by the object will remain a lemon color. When the desired shade of brown is attained, remove the paper from the sunlight, and the image of the object will be on the paper.

Go over the outline with crayons or colors, and fill in the print according to the natural colors. Very beautiful pictures may be made in this way, and a butterfly made up in natural colors on dark-brown ground is very pretty. These prints, uncolored, will keep for some time, if they are not exposed to a strong light.

Washing as ordinary photographic prints are treated will improve them a little. If the instructions are followed, many beautiful objects can be preserved in color.—Contributed by J. B. Murphy, Plainfield, N. J.

Dishwasher and Drier

Where hot water is available the dishwasher illustrated is especially suitable. It is easily constructed and inexpensive, the only real expense being for the tank, which is 15 in. deep and 20 in. in diameter. A washer of these dimensions will hold the dishes from a table serving six to eight persons. The tank may be supported on legs if desired.



The Hot Water from the Faucet is Forced over the Dishes in a Fine Spray

The supports for holding the dishes

in a vertical position are made of wire in a U-shape, the ends being fastened into two wood hoops that snugly fit the inside of the tank, one near the bottom and the other about 9 in. above the first one. The wires are set about 1½ in. apart and radiate from the center like wire spokes in a wheel.

A funnel-shaped piece, having a hole 5 in. in diameter in the center, is made of mesh wire and hung in place with several wires running to the upper edge of the tank. Hooks are attached to the edge of the hole on which cups and glasses are hung.

The cover consists of a wood disk, with a hole bored in its center for a ½-in. pipe. The piece of pipe used should be 3 or 4 in. longer than the depth of the tank. A long thread is cut on the lower end of the pipe, and two rectangular holes are cut in the pipe end through the threaded part. These holes are made by cutting through the pipe as if making a slot for a key. Two large nuts are run on the threads of the pipe. These nuts should be thick enough to cover the slot in the pipe. A pipe cap is then screwed on the end of the pipe. The upper end of the pipe is attached to a hose connected to the hot-water faucet. By separating the two nuts just a little, a fine spray of water will be forced out of the holes.

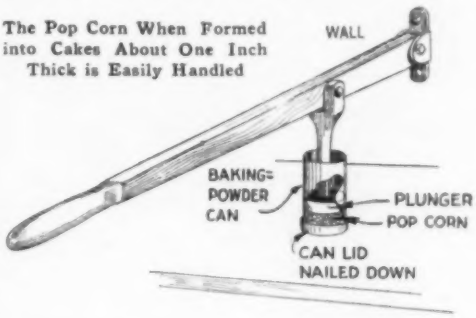
When the dishes are in place the spray of hot water can be directed over them by moving the pipe up and down through the hole in the cover.

After the dishes are washed sufficiently the hose is removed and the tank placed over a gas jet so that the heat will pass up through the funnel-shaped attachment in the bottom of the tank. The dishes, already heated by the hot water, soon dry in the heat from the gas jet. If desired, the tank can be allowed to remain over the jet until the next meal is ready to serve, using a very small flame.—Contributed by W. K. Baxter, Massillon, O.

¶To empty a large sack filled with heavy material, turn or roll it over a barrel.

How to Make Pop-Corn Cakes

It is very difficult to take a bite from a ball of pop corn, and it becomes more difficult as the ball increases in size.



The Pop Corn When Formed into Cakes About One Inch Thick is Easily Handled

As a large number of balls were required for a church entertainment I decided to make the pop corn into cakes. This was more easily accomplished than first imagined with the use of a cake-forming device as shown in the illustration. The body of the former was made of a baking-powder can with the bottom removed. The cover of the can was nailed to the top of an old table with its flange upward. A plunger of wood was made to fit snugly inside of the can and a lever, about 3 ft. long, attached to it and fulcrumed to the wall.

After the pop corn has been prepared with the sirup, it is placed in the can and compressed. The can is then lifted out of the cover and the pop-corn cake removed. This method offers a much better way to serve pop corn than in balls. In making the cakes, the can, cover, and plunger must be kept well covered with butter.—Contributed by Howard A. Hopkins, Youngstown, New York.

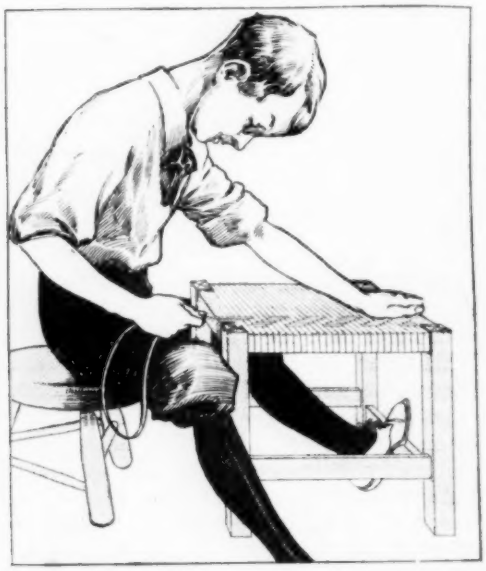
Threading a Darning Needle

Having occasion to use a darning needle, the eye of which was too small to insert the yarn in the usual manner, I tried the following method with good results. A thread was doubled and passed through the eye, and the loop thus formed was used to pull the yarn through.—Contributed by Joe Henderson, Eldred, Ill.

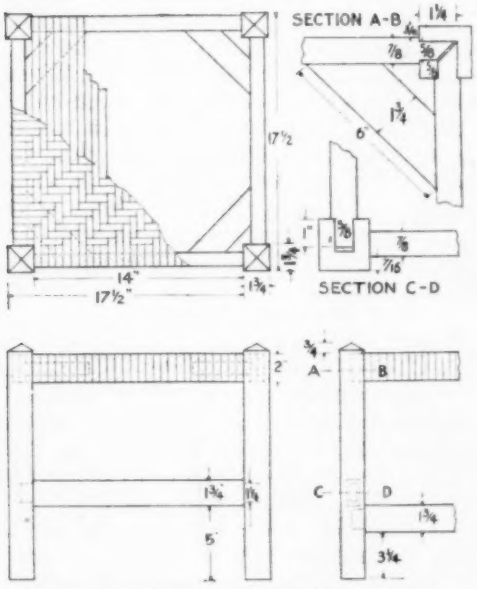
Woven-Top Stool

The material necessary for this stool is as follows:

4 legs, 1¾ by 1¾ by 16 in.
4 bottom rails, ⅞ by 1¾ by 16 in.
4 top rails, ⅞ by 2 by 16½ in.
4 diagonal braces, ⅞ by 1¾ by 6 in.



Weaving the Top of the Stool by Using a Wet Weaver of Reed



Construction of the Frame and Manner of Laying the Weavers for the Top

The legs are mortised so the top rails come level. The upper rails are tenoned on the sides only and beveled at the ends. For the bottom rails, the mortises are made one above the other, the rails being tenoned on all sides. The braces are cut at 45° on each end and glued into place.

In weaving the top, proceed as follows: Use a wet weaver and wrap one layer over the entire top, the strips being placed close together and tightly wound. Start the second layer at right angles to the first by going under one strip, then over three strips, under three, and so on, by threes, until that strip is finished. Start the second by going under two strips, then over three, under three, and so on, as before. The third strip should start by going under three, then over and under three, etc. Start the fourth by going over one, then under three, and over three, as in the preceding; the fifth, start over two, then under and over three, repeatedly. The sixth, and last of the series, begin over three and then continue, by threes, as before. Having finished one series, the remainder of the top should be completed in similar order. Good white shellac makes the best finish for the seat; the stool itself may be finished to suit.—Contributed by Russel Dodsworth, Erie, Pa.

Preserving Shafting from Rust and Corrosion

In a laboratory it was very difficult to keep the line shaft and countershafts bright and free from rust, owing to the fumes and gases issuing from the several fume closets within the same room. The following method was tried, and proved very satisfactory. The shafting was covered with two coats of flat white paint and allowed to dry, after which a coat of white enamel was applied, giving it a clean, glossy, and sanitary appearance. This eliminated all the trouble of cleaning it with emery cloth, and it also made it appear in harmony with the other furnishings of the laboratory.—Contributed by Geo. F. Stark, Norwich, N. Y.

Fishing-Rod Making and Angling

By STILLMAN TAYLOR

PART III—Trout Fishing with Fly and Bait

If He would Take Full Advantage of Any Sport and Reap the Greatest Pleasure from a Day Spent in the Open, the Sportsman should Get Together a Good Outfit

THE art of angling is generally viewed as one of the world's greatest recreations, and while each and every phase of fishing may be said to possess certain charms of its own, fly fishing for trout is regarded by most well-informed sportsmen as the alpha and omega of the angler's art. This is so because the trout family are uncommonly wary and game fish, and the tackle used for their capture is of finer balance and less clumsy than any employed in angling for the coarser game fishes. If he would take full advantage of any sport and reap the greatest pleasure from a day spent in the open, it is really necessary for the sportsman to get together a good outfit. It is not essential to have a very expensive one, but it should be good of its kind, well proportioned for the purpose for which it is to be used. The beginner, who buys without good knowledge of the articles required, or fails to use careful discrimination, is almost certain to accumulate a varied assortment of junk, attractive enough in appearance, perhaps, but well-nigh useless when it is tested out on the stream. A good representative outfit, then, is of the first importance; it means making a good beginning by initiating the novice in the sport under the most favorable conditions. Let us then consider the selection of a good fishing kit, a well-balanced rod, the kind of a reel to use with it, the right sort of a line, flies, and the other few items found in the kit of the practical and experienced trout fisherman.

Selecting a Good Fly Rod

The ordinary fishing pole may be bought offhand at almost any hardware store, but a well-balanced rod for fly fishing should be well tested out beforehand. The requirements call for a rod of comparatively light weight, a rod that is elastic and resilient, and yet strong enough to prove durable under the continued strain of much

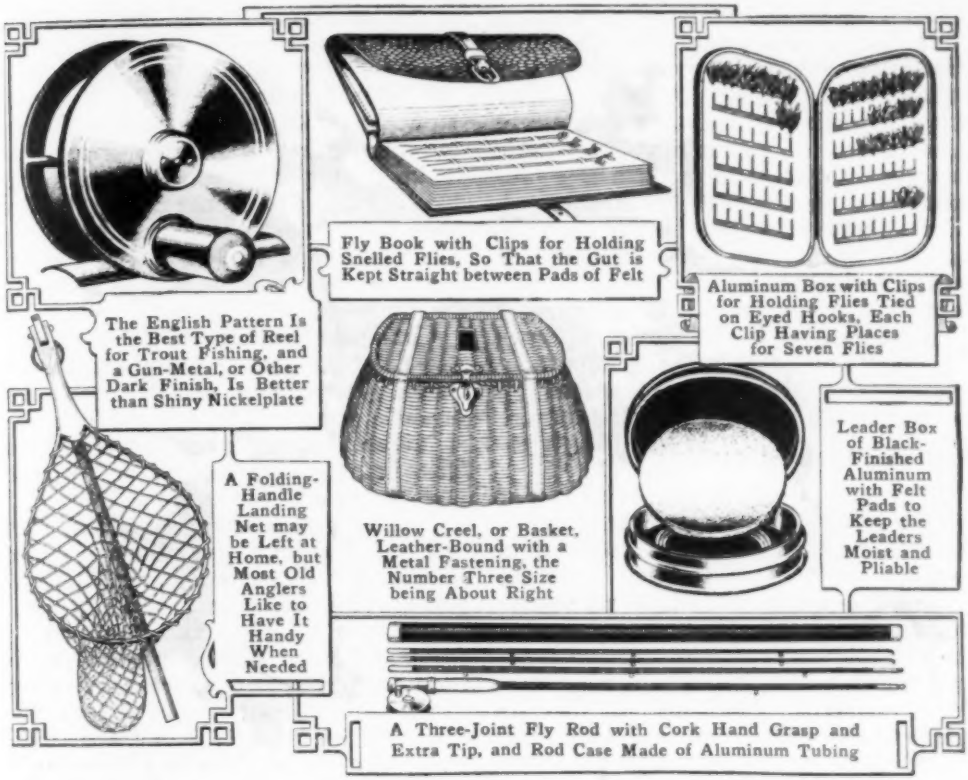
fishing. If the angler has made his own rod, as suggested in former chapters, he will have a good dependable fly rod, but the large majority of anglers who are about to purchase their first fishing kit should carefully consider the selection of the rod. At the outset it must be understood that good tackle is simply a matter of price, the finest rods and reels are necessarily high in price, and the same thing may be said of lines and flies. Providing the angler has no objection to paying $15, or more, for a rod, the choice will naturally fall upon the handmade split bamboo. For this amount of money a fair quality fly rod may be purchased, the finer split bamboos costing anywhere up to $50, but under $15 it is very doubtful whether the angler can procure a built-up rod that is in every way satisfactory. The question may arise, Is a split-bamboo rod necessary? The writer's own long experience says that it is not, and that a finely made solid-wood rod, of greenheart or dagame, is quite as satisfactory in the hands of the average angler as the most expensive split bamboo. A good rod of this sort may be had for $10, and with reasonable care ought to last a lifetime.

The points to look for in a fly rod, whether the material is split bamboo or solid wood, is an even taper from the butt to the tip; that is, the rod should register a uniform curve, or arc, the entire length. For general fly casting 9 ft. is a handy length, and a rod of 6½ oz. weight will prove more durable than a lighter tool. A good elastic rod is wanted for fly casting, but a too willowy or whippy action had best be avoided. However, for small-brook fishing, where the overgrown banks prohibit long casts, a somewhat shorter and stiffer rod will be more useful. For casting in large northern streams, where the current is swift and the trout run to a larger size, a 9½ or 10-ft. rod of 8 oz. weight is often preferred. Of course, the veteran angler can safely use a much lighter rod than the beginner, and one occasionally meets a man on the stream that uses a 5-oz. rod for pretty heavy fishing. To be on the safe side, the novice will make no mistake in choosing a rod of fair length and conservative weight.

When selecting a rod in the tackle shop, do not rest content with a mere examination of the appearance, but have the dealer affix a reel of the weight and size intended to be used with it. By reeling on a short length of line and reeving it through the guides and then fastening the end to a weight lying upon the floor, a very good idea of the rod's behavior may be gained, since by reeling in the line and putting tension on the rod its elasticity and curve may be seen and felt as well as in actual fishing. To give the utmost satisfaction, the rod should fit its owner, and several rods should be tried until one is found that most fully meets the angler's idea of what a rod should be. If one happens to have a good fly reel, by all means take it along and attach it to the rod while making the tests. It is practically impossible to gauge the balance of a rod without affixing the reel, and many a finely balanced tool will appear badly balanced until the proper-weight reel is affixed to it.

The Proper Kind of Reel

For fly fishing nothing is so good as the English style of click reel, which is made with a one-piece revolving side plate and with the handle affixed directly to it. Any kind of a balanced-handle reel is an out-and-out nuisance on the fly rod, because it has no advantage in quickly recovering the line, and the projecting handle is forever catching the line while casting. In fly casting, the length of cast is regulated by the amount of line taken from the reel before the cast is made, and it is while "pumping" this slack line through the guides, in making the actual cast, that the balanced or projecting handle is very apt to foul the line. A good reel that is smooth-running like a watch will cost about $10, but a very good one may be had for $5, and cheaper ones, while not so durable, may be


The English Pattern Is the Best Type of Reel for Trout Fishing, and a Gun-Metal, or Other Dark Finish, Is Better than Shiny Nickelplate
Fly Book with Clips for Holding Snelled Flies, So That the Gut is Kept Straight between Pads of Felt
Aluminum Box with Clips for Holding Flies Tied on Eyed Hooks, Each Clip Having Places for Seven Flies
A Folding-Handle Landing Net may be Left at Home, but Most Old Anglers Like to Have It Handy When Needed
Willow Creel, or Basket, Leather-Bound with a Metal Fastening, the Number Three Size being About Right
Leader Box of Black-Finished Aluminum with Felt Pads to Keep the Leaders Moist and Pliable
A Three-Joint Fly Rod with Cork Hand Grasp and Extra Tip, and Rod Case Made of Aluminum Tubing

used with fair satisfaction. The heavier multiplying reels, so essential for bait casting from a free reel, are altogether unsuited for the fly rod, being too heavy when placed below the hand, which is the only proper position for the reel when fly casting. The single-action click reel, having a comparatively large diameter, but being quite narrow between the plates, is the one to use, and hard rubber, or vulcanite, is a good material for the side plates, while the trimmings may be of german silver or aluminum. The all-metal reel is of about equal merit, but whatever the material, the most useful size is one holding about 40 yd. of No. E size waterproof line. A reel of this capacity will measure about 3 in. in diameter and have a width of about ⅞ in. between plates. A narrow-spooled reel of this type enables the fisherman to reel in the line plenty fast enough. Owing to the fact that the reel is placed below the grip on fly rods, a rather light-weight instrument is needed to balance the rod. Of the two extremes, it is better to err on the side of lightness, because a heavy reel makes a butt-heavy rod and, throwing extra weight on the wrist and arm, makes casting increasingly difficult after an hour's fishing. An old hand at the game will appreciate this point better than the novice.

The Kind of Line to Use

The fly-casting line used by a veteran is generally of silk, enameled and having a double taper; that is, the line is thickest in the center and gradually tapers to a smaller diameter at each end. Single-tapered lines are likewise extensively used, and while they cost less, they are tapered at one end only and cannot be reversed to equalize the wear caused by casting. The level line, which has the same diameter throughout its entire length, is the line most generally used, but the cast

cannot be so delicately made with it. For the beginner, however, the level line in size No. E is a good choice. For small-brook fishing, No. F is plenty large enough. In choosing the size of line, there is a common-sense rule among fly casters to select a line proportioned to the weight of the rod. For a light rod a light line is the rule, and for the heavier rod a stouter line is the logical choice. If the rod is of a too stiff action, use a comparatively heavy line, and it will limber up considerably; if the rod is extremely "whippy," use the lightest line that can be purchased, and used with safety.

A Fine Leader Marks the Expert Caster

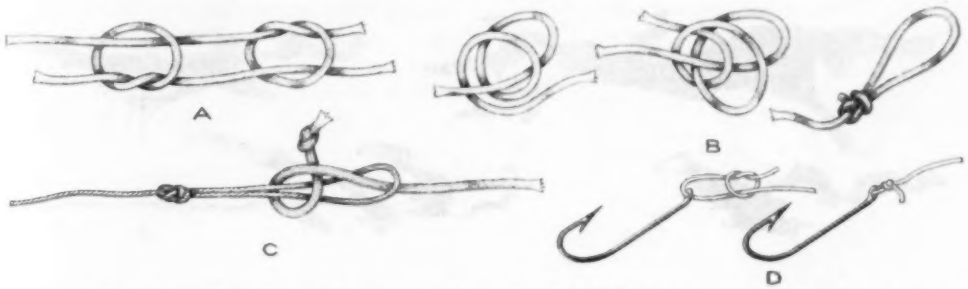
The leader for trout is preferably of single gut, and as fine as the angler's skill will allow. The fly caster's rule is to use a leader whose breaking strain is less than the line, then, when the tackle parts, it is simply a question of putting on a new leader and the more expensive line is saved. Ready-made leaders may be purchased, or the angler can tie them up as desired. For length, a 3 or 3½-ft. leader is about right for average fishing. Longer leaders are used, and while they sometimes are of advantage, the 3-ft. length is more useful. A longer leader is awkward to handle because the loop is apt to catch in the top of the rod when reeling in the line to bring the fish close to the landing net. Leaders may be had with a loop at each end, or with loops tied in, for using a cast of two or three flies. For all average casting, the two-fly cast is the best, but the expert angler uses the single-fly very often. For lake fishing, the single large fly is generally preferred. For using two flies, the leader is provided with three loops, one at the top, another at the bottom, and an extra loop tied in about 15 in. from the lower loop. In fly casting, the first, or upper, fly is known as the "dropper," and the lower one as the "tail" fly. For the single-fly cast but two loops are required.

Gut used for leaders should be carefully selected, and only those lengths which are of uniform diameter and well rounded chosen, the lengths which show flat and rough spots being discarded. Dry gut that is very brittle should be handled very little, and previous to a day's fishing the leaders must be soaked in water over night to make them pliable, then coiled in between felt pads of the leader box to keep them in fishing shape. After use, put the frayed leaders aside and dry them out between the flannel leaves of the fly book.

Gut is the product of the silkworm, and the best quality is imported from Spain. It comes in bundles, or hanks, of 1,000 strands, 10 to 20 in. long and in different thicknesses, or strengths. The heaviest are known as "Royal" and "Imperial," for salmon; "Marana," for extra-heavy bass; "Padron," for bass; "Regular," for heavy trout; "Fina," for light trout, and "Refina," for extra-light trout. The grades "Fina" and "Refina" are well suited for all average fly fishing, while the heavier sizes are useful for heavy large fishing.

To make the leaders, soak the strands of gut in warm water over night until they are soft and pliable. Select the strands for each leader of the desired thickness and length so that the finished leader will have a slight taper to one end only. By using the "Fina" gut for the upper length and tying in two lengths of "Refina" gut, a nicely tapered leader of light weight is obtained. Begin the leader by uniting the strands together to make it the correct length, three 12-in. strands being about right for average casting. The "single water knot" is the strongest and neatest to use. Make it by taking the thick end of the strand and doubling it back enough to tie in a common knot just large enough for the line to pass through and drawing it up tightly. Tie a single loose knot in the other end of the strand, about ⅛ in. in diameter and close to the end; take the next thickest strand of gut, thread the thicker end through the loose knot and tie a second square knot around the strand, as shown at A. By pulling on the two

long ends the loops can be drawn up tightly, and the two knots will slide together and make a neat and very strong knot. Repeat this operation until as many strands of gut are knotted together as required to make the leader of the desired length. For making the loop at the ends, a double-bighted knot, tied as shown at B, is used. If a dropper fly is desired, do not pull the water knot tightly, but first insert a short length of gut with a common knot at the end and a loop in the other, then draw the water knot up tightly, and a short snell will be made for attaching the fly as usually.



The Single Water Knot Used in Tying Leaders; a Good Knot for Making the Loop at the End of the Leaders; an Angler's Knot Used for Attaching the Line to the Leader, and a Jam Knot for Attaching Eyed Flies, or Hooks, to the Leader or Snell

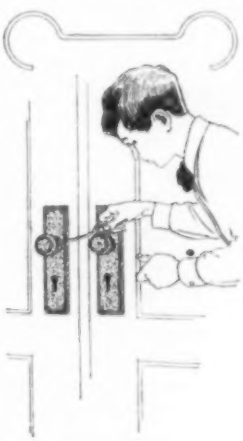
Flies for Trout Fishing

The standard selection of artificial flies numbers about 60, but the average fisherman will find about 24 selected patterns to answer every need. For making up the most "killing" flies for the trout season, the following can be recommended: Use red ibis, stone fly, cinnamon, red spinner, and parchmenee belle, for April; turkey brown, yellow dun, iron blue, spinner, montreal and red fox, for May; spider, black gnat, silver doctor, gray drake, orange dun, and green drake, for June; July dun, grizzly king, pale evening dun, red ant, and brown palmer, for July; Seth green, coachman, shad, governor, August dun, and royal coachman, for August, and black palmer, willow, whirling dun, queen of the water, and blue bottle, for September.

To attach a line to the leader the well-known "angler's knot" is mostly used. This knot is shown at C. The snelled fly is attached by passing the loop over the loop of the leader and inserting the fly through the leader loop. When eyed flies are used they are often attached direct to the leader, or a looped snell may be used as in the ordinary American-tied fly. To attach the eyed fly direct to the leader, the common "jam knot," shown at D, is mostly used, and when the slipknot is drawn up tightly and the extra end cut off it makes a small, neat knot, not apt to slip.

Catch to Hold Two Joining Doors Open

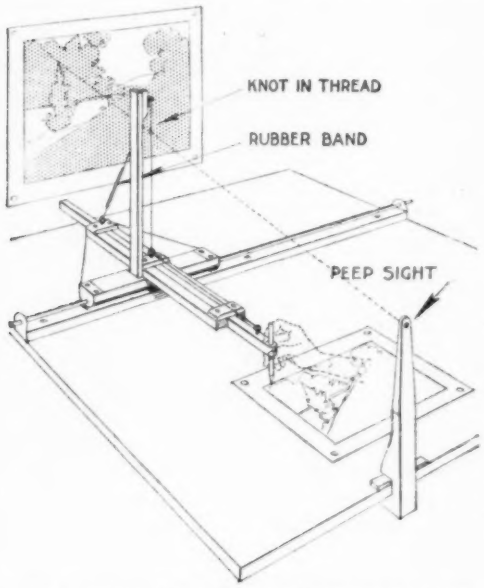
Where two open doors meet, a catch to keep them open can be made of a piece of wire, shaped as shown. The hooks at the ends of the wire are slipped over the shanks of the knobs.—Contributed by W. A. Saul, Lexington, Mass.



¶Strips cut from wood dishes used by grocers for butter, thoroughly soaked in warm water, will make excellent repair pieces for market baskets.

Machine for Sketching Pictures

An ordinary drawing board, with the attachments shown, provides an easy way to sketch pictures, even if



This Machine Aids a Person in Drawing the True Outline of a Picture

one is not proficient in this line of work. It is only necessary to look through the sight and move the pencil about so that the knot in the thread follows the outline of the landscape or object being drawn.

The size of the machine depends on the one building it, but a fair-sized drawing board is sufficient for the beginner. A strip of wood is fastened to the board, near one edge, which has a metal piece on each end, fastened to the under side and bent up over the end to form an extension for the rod to support the moving parts. The strip of wood should be ¾ in. wide and ¼ in. thick, and the sliding arm, holding the pencil, ½ in. wide and ¼ in. thick. A like strip, but much shorter than the one fastened to the board, is also fitted with metal pieces in an inverted position so the projections will be downward. A $\frac{3}{16}$-in. rod is run through holes in the metal pieces of the strips at both ends, and soldered to those on the strip fastened to the board. This will make a hinged joint, as well as one that will allow the upper strip to slide horizontally.

Centrally located on the upper strip are two more strips, fastened with screws at right angles to the former, with a space between them of ½ in. for the sliding center piece holding the pencil. These pieces are further braced with a wire at the back, and crosspieces are screwed both on top and under side, to make a rigid guide for the sliding pencil holder. An upright is fastened to the side of one of these pieces over the center of the upper horizontal sliding piece for a screw eye to hold the thread. Another screw eye is turned into the crosspiece just under the one on the support, so that the thread will run perpendicularly between them. Two more screw eyes are fastened, one into the upper surface of the rear crosspiece, and the other in the end of the pencil holder, near the pencil. By connecting these screw eyes, as shown, with a thread, having a rubber band fastened in the rear end and a knot tied in it near the screw eye in the upper end of the vertical stick, a means for following the outlines of the picture is provided.

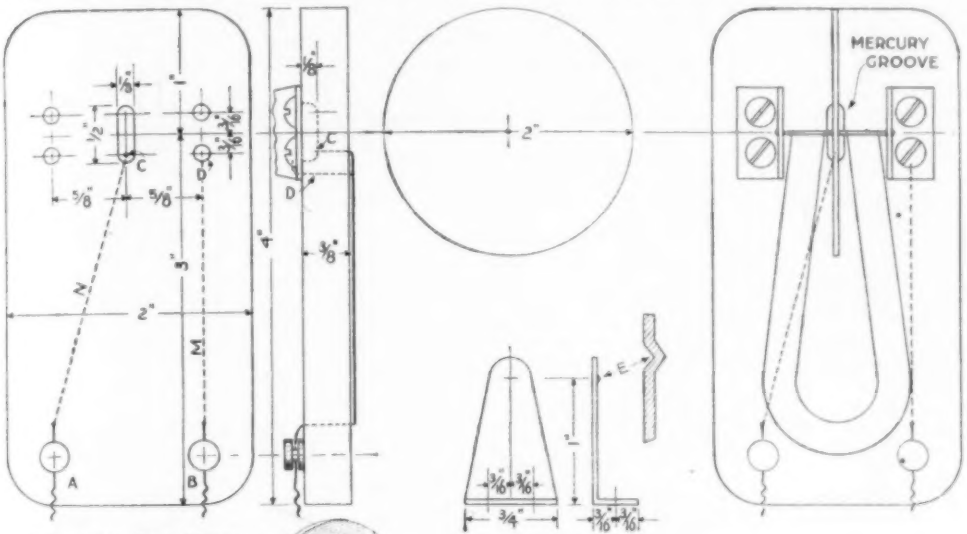
A vertical stick is fastened to the front edge of the board by means of a notch and wedge. In the upper end of this stick a very small hole is bored for a sight, similar to a peep sight on a rifle.

To use the machine, set the board on a table, or tripod, and level it up in front of the object to be drawn. Look through the sight at the front of the board and move the pencil about to keep the knot of the thread on the outlines of the picture to be drawn.—Contributed by Wm. C. Coppess, Union City, Ind.

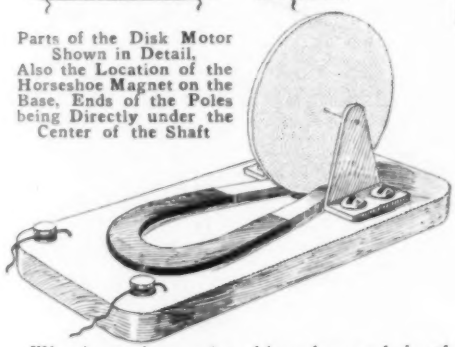
¶A walnut filler is made of 3 lb. burnt Turkey umber, 1 lb. of burnt Italian sienna, both ground in oil, then mixed to a paste with 1 qt. of turpentine and 1 pt. of japan drier.

A Disk-Armature Motor

One of the simplest motors to make is the disk motor, its construction requiring a wood base, a brass disk, a 3-in. horseshoe magnet, and some mercury.



Parts of the Disk Motor Shown in Detail, Also the Location of the Horseshoe Magnet on the Base, Ends of the Poles being Directly under the Center of the Shaft



The base is made of hard wood, in the proportions shown in the sketch. The leading-in wires are connected to the binding posts A and B, and from these connections are made, on the bottom of the base, from A to the groove C cut in the upper surface of the base for the mercury, and from B to one screw, D, of one bearing. The end of the former wire must be clean and project into the end of the groove, where it will be surrounded with mercury.

The bearings consist of thin sheet brass, cut to the dimensions shown, the bearing part being made with a well-pointed center punch, as at E. The disk wheel is made of sheet brass, 2 in. in diameter, and a needle, with the eye broken off and pointed, is used for the shaft. The needle shaft can be placed in position by springing the bearings apart at the top.

When the current is applied, the disk will revolve in a direction relative to the position of the poles on the magnet. The reverse can be made by turning the magnet over.—Contributed by Joseph H. Redshaw, Homestead, Pa.

Repairing Marble

With a little practice any mechanic can repair holes, cracks or chipped places on marble slabs, so that the patched place cannot be detected from the natural marble. Use the following mixture as a base for the filler: Water glass, 10 parts; calcined magnesite, 2 parts, and powdered marble, 4 parts. These should be mixed thoroughly to a semifluid paste. Fill the crack or hole and smooth off level, then with a camel's-hair brush and colors, made of aniline in alcohol, work out the veins, body colors, etc., as near to the natural marble as possible. It will depend on the application of the colors whether the repair can be seen or not. Artificial-marble slabs can be formed from this mixture.—Contributed by A. E. Soderlund, New York City.

INTERESTING NEW PATENTS

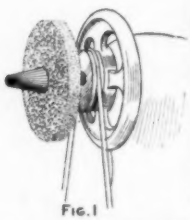


FIG. 1

GRINDING ATTACHMENT FOR SEWING MACHINES (Fig. 1)—The grinding disk is mounted on a screw that fits into the screw hole ordinarily occupied by the nut used for locking the flywheel and belt wheel to the shaft. A cone-shaped steel shaft projects outward from the center of the disk, and the taper of the shaft is such that, with the blade of a pair of scissors laid flat on the shaft, the edge is ground to the right angle. The edge of the disk is used for grinding of any kind.

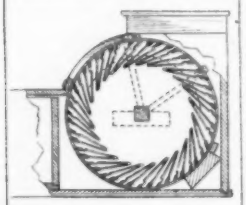


FIG. 3

SEMAPHORE FOR RURAL MAIL BOX (Fig. 2)—When the semaphore arm is raised to a horizontal position it is a signal that mail has been left in the box. The arm is connected by a series of levers to an inverted-U-shaped trigger which stands upright when the arm is in the lowered position. When the wheel of the carrier's wagon passes over this trigger the arm is raised to the horizontal position and remains in that position until it is reset.

FILING CABINET (Fig. 3)—This cabinet has the form of a drum and is mounted on a horizontal shaft. The ends of the drum are closed, while the periphery consists of a series of longitudinal strips on which are mounted filing pockets, as shown. Access to the pockets is through an opening near the top of the casing in which the drum revolves.

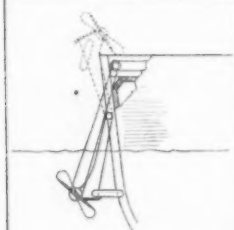


FIG. 5

NOVEL STEERING GEAR FOR MOTOR VEHICLE (Fig. 4)—With this apparatus both the front and rear wheels are turned in steering the vehicle. Steering bars run from the ends of the axles to pivots that slide in slots in a horizontal plate at the middle of the chassis. These pivoted ends are cross-connected by links that are pivoted at their intersection, as shown, while a bell crank controlled by the steering column is pivoted to this intersection. The whole link mechanism is pushed or pulled to one side by the bell crank, and the axles are swung by the sliding of the steering-bar ends along the slots.

FIG. 7

PROPELLER FOR TURNING SHIP (Fig. 5; British patent)—The propeller is driven by a belt and is carried on a frame that is pivoted to the stem of the ship, so that the propeller can be lowered into the water or raised clear as required. The force is exerted athwartships, the propeller being intended for use in turning the ship.

MULTIPLE-WING AEROPLANE (Fig. 6)—Increased sustaining power and stability are evidently the ends sought in this curious arrangement of planes. The planes are flexible and are so connected that they are always warped simultaneously and in the same direction.

POISON BOTTLE (Fig. 7; British patent to an American)—An elongated opening passes through the bottle midway between the top and bottom, leaving curved triangular sections at the sides. The purpose is to make the bottle of such distinctive shape that its character will be detected the instant it is picked up.

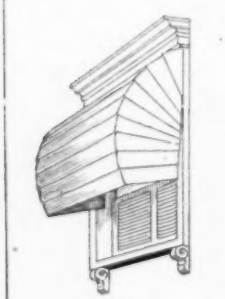


FIG. 9

SUPPORT FOR FRUIT-LADEN TREE (Fig. 8)—This support consists simply of a netting of coarse weave drawn around the tree so that it takes the outward thrust of the branches. The netting has a joint extending from top to bottom and is held in place by lacing or clamping the edges together.

TELESCOPING AWNING (Fig. 9)—This awning consists of a set of telescoping sections pivoted to a common center in the window frame. When folded back the awning is concealed in the window recess.

WHEEL WITH FLAT TREADS (Fig. 10)—The wheel is entirely inclosed by links which are shaped to fit over the rim, and at each of the connections between links a flat tread is pivoted. The whole device is so adjusted that at any time three of the treads will lie flat on the ground under the wheel.

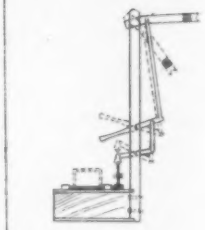


FIG. 2

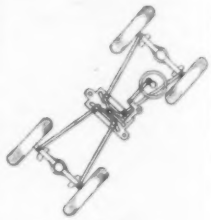


FIG. 4

FIG. 6

FIG. 8

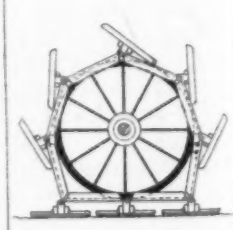


FIG. 10

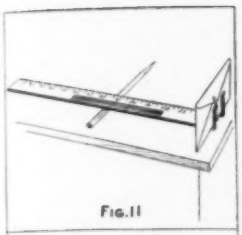


FIG. 11

COMBINED RULER AND POSTAL SCALE (Fig. 11)—This simple device is made to be used both as a ruler and as a weighing beam for postal matter. One end is equipped with clips for holding an envelope vertically, and one side is marked with a scale of postal charges. In using, the letter is placed in the clips and the ruler is balanced on a pencil. The scale reading at the point above the pencil gives the amount of postage required.

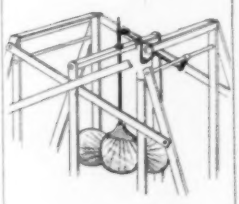


FIG. 13

APPARATUS FOR PROTECTING FRUIT TREES FROM FROST (Fig. 12)—The essential feature of this invention is a fabric cover closing a ring that is suspended over the tree and a curtain that is supported by this ring and hangs around and incloses the tree. It can be used in connection with an orchard heater of any type. When not in use the curtain is drawn up and fastened to the ring.

FAN ATTACHMENT FOR LAWN SWINGS (Fig. 13)—Fans are fixed to the bottom of a shaft which is journaled in the top of the swinging frame so that the fans hang directly over the seat. The top of the shaft has a crank arm which is connected by a rod with the rigid supporting frame, and as the seat is swung, the fans are also swung and rotated.

CALENDAR WATCH FOB (Fig. 14; design patent)—Inside the ornamental cover is a rotatable disk around the edge of which are marked the days of the month. A section of the cover, long enough to expose seven numbers, is cut away, and along the edge of this section the seven days of the week are marked. The disk is set from week to week so that the days of the month and of the week will correspond.

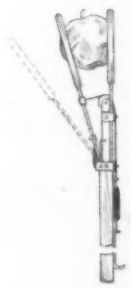


FIG. 15

FRUIT PICKER (Fig. 15; British patent)—The fixed and movable jaw each consists of a wire loop shaped to engage the fruit. The movable jaw is pulled against the fruit by a cord that extends down the pole and terminates in a handle. When the handle is released the cord is pulled up by a spring and the movable jaw swings outward under its own weight.

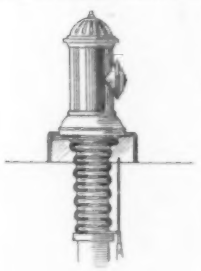


FIG. 17

SHOCK ABSORBER (Fig. 16)—This device consists of a cylinder in which a hollow, elongated piston works, and both the cylinder and the piston contain liquid. In the lower face of the piston is a valve that retards the passage of the liquid in one direction, but permits it to flow freely in the other direction. In the piston are baffles and at the top are air vents. The idea of the invention is to absorb the shock by retarding the flow of the liquid and air and, therefore, the motion of the piston.

STEAM-JACKETED FIRE HYDRANT (Fig. 17)—The hydrant is equipped with a system of steam coils passing around the base. In case the hydrant is found to be frozen, the inlet and outlet are connected with the fire engine, and steam is passed through the coils.

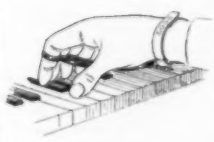


FIG. 19

ICE-MOBILE OPERATED BY HAND (Fig. 18)—At the sides of the sled are toothed wheels that work on one shaft and are set so that they bear against the ice. The sled is propelled by these wheels by means of a handle bar that is connected by a rod with a crank arm on the shaft.

FINGER TRAINER FOR PIANISTS (Fig. 19)—This device is designed to hold the fingers in the correct position as they strike the piano keys. It consists of a wrist band to which elastic bands, one for each finger, are attached. The finger bands can be varied for length, and the loops can be adjusted for fitting the fingers.

BLOWER ATTACHMENT FOR HANDSAW (Fig. 20; American patent to a Canadian)—This device consists of a bulb attachment designed for blowing the sawdust away from the saw cut. The bulb is of rubber and is placed in a recess in the handle so that it is conveniently pressed by the hand. A tapering stem projects downward from the bulb and the bottom of this stem is curved so that a blast of air will be thrown forward along the line of the saw blade.

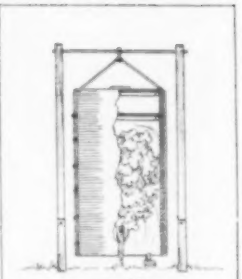


FIG. 12

FIG. 14

FIG. 16

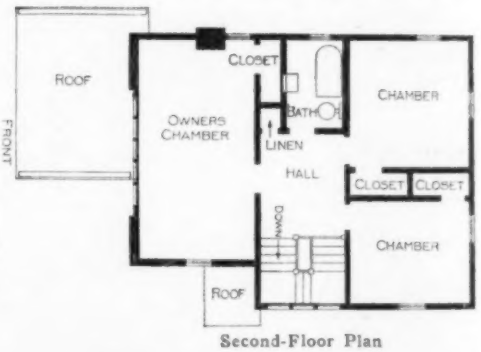
FIG. 18

FIG. 20

AN ATTRACTIVE SEVEN-ROOM STUCCO COTTAGE

M. L. KEITH, ARCHITECT, MINNEAPOLIS, MINN.

First-Floor Plan



Second-Floor Plan

THIS stucco cottage is interesting both for the simplicity and effectiveness of the exterior treatment and for the novel way in which the floor space is utilized. The front entrance, which is placed at the side of the building and is given little prominence as an exterior feature, opens into a small reception hall, and from this there is direct access to the living room, kitchen, and second floor. The living room extends entirely across the building and has a massive fireplace at one end. The living room and dining room have beamed ceilings. At the front of the building is the sun room. This is one of the features emphasized in the exterior treatment, which is practically free from ornament. The cottage is a frame structure having exterior walls of cement stucco laid on metal lath. The foundations are of concrete below the grade line, and of brick above this line, while the roof is of stained shingles. The building is estimated to cost about $3,700 under ordinary market conditions.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor].